

The
TOOL ENGINEER

DO YOU HAVE A BLANKING
PROBLEM THAT DEMANDS

★ INTRICATE DESIGN ★ THIN SECTIONS
★ STABLE SIZE AND SHAPE?

Q-H-L-O DIE
WILL SOLVE IT

The last deviation from standard die balance would be very apparent on this blanking job—that's why a large electrical manufacturing company placed its order with Q-H-L-O.



STEEL CO. LATROBE, PA.

Are you machining?

ALUMINUM?



These are the tool characteristics that work best

P&W sales engineers can help you find the tool angles and design that will cut best on your aluminum work.

IT is important to have *sharp* cutting edges, and smooth, highly polished cutting faces when machining aluminum. Burred or dull edges will tear this metal and cause trouble. It cuts freely with keen tools ground on a fine abrasive wheel. Occasional hand stoning will improve results between grinds.

In general, tools designed for cutting steel will work on aluminum, but slight modifications will improve their efficiency tremendously.

Milling cutters and end mills should have coarse teeth and plenty of chip room. The rake should be increased to 20°. This will produce a better shearing action and tightly curled chips. Highly polished spiral flutes work best, and notched cutting edges will keep down the chip size.

Taps should be undercut and have highly polished flutes. Ordinary tap rake angles (6° to 8°) should be increased to from 12° to 15°. Spiral pointed taps work well in aluminum, and on deep blind holes taps with right hand spiral flutes will pull the chips up and save tearing. On taper taps it is well to reduce the relief slightly so that chips left clinging to the threads on reversal will be sheared off closely as the tap is backed out of the hole.

Reamers ordinarily are made with no rake, but when machining aluminum they should have 5° to 8° rake to improve the shearing action. Saws should have coarse teeth, a 15° rake, and double the clearance used in

cutting steel. In some cases good practice calls for one saw tooth cutting deep and the next one wide, with a positive feeding device to prevent "digging in." Saws made for cutting steel can be altered for aluminum by removing every other tooth to provide extra chip room, changing the rake angle as mentioned above, and polishing the various surfaces to reduce chip friction.

Turning tool angles differ from those used for steel. Top rake increases, and varies from 20° up depending on the tool and the operation. Side rake from 10° to 20° helps to smooth out the cut. Clearance should be from 8° to 10°.

One of the most difficult aluminum alloys to machine contains 10% silicon, and is commonly used for automotive pistons. Carbide tipped tools work best on this highly abrasive material.

In general use high cutting speeds with fine feeds. Usually more metal can be removed successfully by increasing the speed rather than the feed. Much heat is generated when feeds are heavy, and this causes excessive expansion troubles on centers and will produce inaccurate results. Special soluble cutting oils or a mixture of kerosene with either paraffin or lard oil should be used in large streams to offset overheating. Always cool the work before measuring for final results.

If you have special cutting tool problems never hesitate to ask a Pratt & Whitney sales engineer for help. *We stand ready to do everything possible* to aid our friends and do our full part in speeding up *national defense*. We've been making cutting tools for 80 years and our experience and knowledge are yours for the asking. Write to PRATT & WHITNEY, Division Niles-Bement-Pond Company, WEST HARTFORD, CONN.

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THE TOOL ENGINEER

Volume X

JULY, 1941

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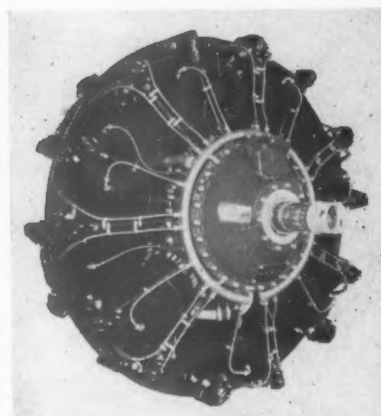
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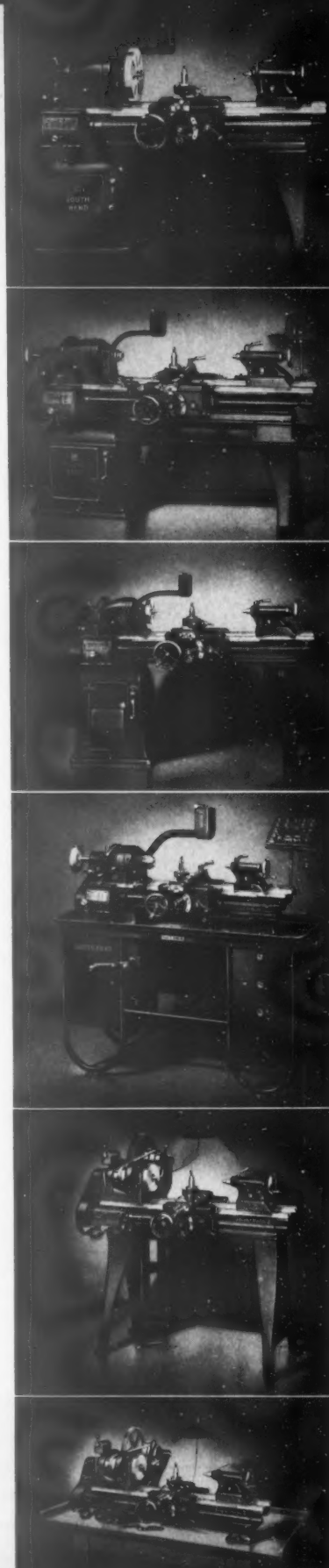
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Machine in Brief

Horizontal machine with two standard self-contained hydraulic units, utilizing arbor milling cutters, to machine king-pin bosses simultaneously. Flexibility of unit design allows for relocation in case of future changes in axle design. Machine cycle is controlled with pushbuttons.

An unskilled operator, after a few minute's instructions, is producing approximately one axle per minute.

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Let our experience be your catalog. For our job in this emergency is to draw from this past experience and design faster, simpler, and more accurate machines so that you can do more work with less equipment. An example of our work with a truck manufacturer is shown to the left. It's one of many of our installations and representative of our method of building special machine tools to *fit a specific job*.

Upon receipt of your part print and production requirements, we will be glad to furnish a preliminary design and estimate.



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25 Years

*Service
to
Industry*

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From a very modest beginning in July twenty five years ago, Logansport Machine has grown to a position of leadership in the Air and Hydraulic Equipment fields. From the start "LOGAN" has been meeting fundamental needs, furthering progress, translating today's problems into tomorrow's increased production. For twenty-five years "LOGAN" Equipment has saved Time—Effort—Motion.

It is fitting, therefore, that we choose this occasion to honor our founder . . . to acknowledge the splendid cooperation of our friends in industry . . . and to rededicate this Company's efforts to a continuing service to industry and to National Defense.

LOGANSPORT MACHINE, INCORPORATED
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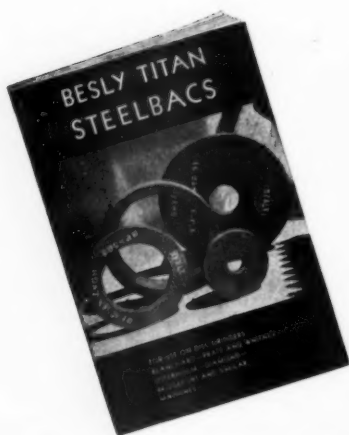
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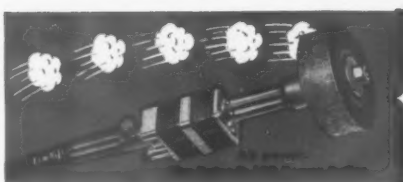
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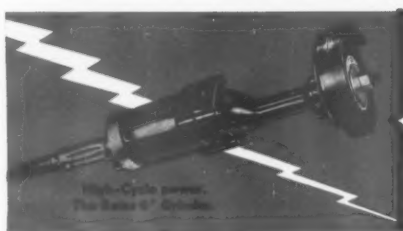
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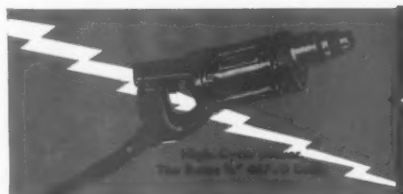
Three problems in one plant ...I licked them all with AIR and HIGH-CYCLE



Situation No. 1. A tough buffing job, calling for heavy pressure on wheel. Plenty of air available. Recommended *Air* tools—Rotor D-100 "Power-plus" Buffers.



Later—Situation No. 2. Defense orders required expansion of another department, with 12 tools—die grinders, straight grinders, and vertical grinders. Air compressor to run 12 tools only would cost \$2497. High-Cycle generator set of twice the capacity—that is to run ultimately 24 tools—would cost \$1301 complete, and could be delivered quicker. 12 Rotor *High-Cycle* tools were installed right away.



Later—Situation No. 3. Wanted $\frac{1}{4}$ " drills for work next to office. *Quiet* operation required. Suggested running a high-cycle line to this location from their generator set. So this is a quiet *High-Cycle* job for Rotor 467-D Drills.

How about YOUR problems? With *Air* and *High-Cycle*, I can supply answers which fit your portable tool problems like a glove. See how this unbiased service and Rotor Tools can speed up your production and cut your costs!

—THE ROTOR ANALYST

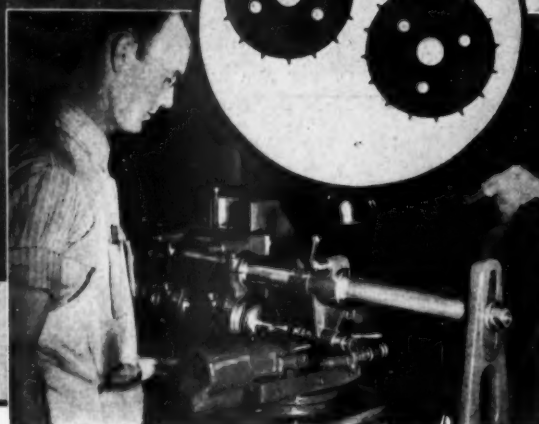
The Rotor Analyst has 65 different *Air* tools and 59 different *High-Cycle* tools with which to solve your problems.

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Film Sprockets Finish Hobbed In One Operation with B-C Hobs



Quick Facts

Hob — Special B-C ground topping sprocket hob
1 7/8" dia. and length, 3/4" str. bore, 13 gashes,
single thread.

Part — Film sprocket for moving picture projector.

Material — Stainless steel.

Operation — Hobbing special sprocket wheels having
16 teeth, 1.581" ± 0.001 " O.D., 0.046" face,
0.036" ± 0.001 " tooth thickness, 1.455" root dia.,
0.295" circular pitch.

Hobbing Machine — B-C No. 3 Precision.

Holding — Chuck collet arbor.

Feed — 0.007" per rev. of work.

Hob Speed — 157 r.p.m.

Production — Approximately 16 minutes per load
of 15.

Accuracy — Tooth form must be very accurate. Total
runout within 0.001" on O.D. Tooth thickness
0.036" ± 0.001 ".

Pieces per Setting — 200.

Pieces per Grind — 800.

Remarks — This special hob designed by B-C Hob
Engineers, and used on a B-C No. 3 Precision Hob-
bing Machine, solved a particularly difficult pro-
duction problem presented by the form of the part
and nature of material.

Sprocket Tooth Form, Spacing, and Runout Held to Precision Accuracy

Gearing for this purpose requires the utmost in accuracy, otherwise the delicate film passing over the sprockets, at the relatively high speeds employed, would be damaged.

Barber-Colman Hobbing Service solved this problem by designing a special ground hob which is used on a Barber-Colman No. 3 Precision hobbing machine. A load of 15 stainless steel sprockets is hobbed at one time, holding tooth thickness to 0.036" ± 0.001 ", and runout on the outside diameter within 0.001". Production is approximately 16 minutes per load of 15, and the hob life is 800 pieces per sharpening.

This is another example of a tough manufacturing problem that was solved by Barber-Colman Hobbing Service. If you have a similar part or some other part that could be produced by the hobbing process, rather than by another method, it may pay you to put it up to the B-C Engineers. There is no obligation.

● Right: Here is the special ground sprocket hob that is used to produce film sprockets to precision accuracy on a production basis. Many times it is possible to use the hobbing process to manufacture parts with greater accuracy and at lower cost. See pages 60 to 64 in Catalog K for special hobs and miscellaneous special hobbled forms.



BARBER
B-C
COLMAN
PRODUCTS

HOBBS, HOBGING
MACHINES, HOB
SHARPENING MA-
CHINES, REAMERS,
REAMER SHARP-
ENING MACHINES,
MILLING CUTTERS,
SPECIAL TOOLS

Barber-Colman Company

General Offices and Plant 213 Loomis St., Rockford, Illinois, U. S. A.

"IMPOSSIBLE!"
they said five years ago

Vascoloy
RAMET

**Tantalum - Tungsten
Carbide Tools**

AS NEAR AS YOUR TELEPHONE

Call the nearest of these
**FACTORY-OWNED
BRANCHES:**

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NEW YORK AREA
Journal Square 2-2231
PHILADELPHIA Rittenhouse 8360
PITTSBURGH Atlantic 9699
PROVIDENCE Dexter 1271
ST. LOUIS Newstead 3110
SYRACUSE 3-0334



Where you cannot use
cemented carbide, use
TANTUNG "G"

the new Miracle Cutting Metal (not a steel,
not a cemented carbide) . . . most efficient
at speeds about double those of high speed
steel. Available in two styles and 65
standard sizes. Ask for information.



... but today it's BEING DONE!

Carbide tool performance records that were
"magnificent" only a few years ago, now
look like "ancient history" in the light of the super-
performance of Vascoloy-Ramet tools.

New production records in the number of pieces
per grind, per tool, per hour and per dollar are being
made almost daily . . . and Vascoloy-Ramet tools are
helping to make 1941 the greatest production year
in American history.

If you want extra production *at no extra cost* call
in a Vascoloy-Ramet factory representative or
authorized agent. Do it today.

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

An Affiliate of

FANSTEEL METALLURGICAL CORPORATION

and

VANADIUM-ALLOYS STEEL COMPANY

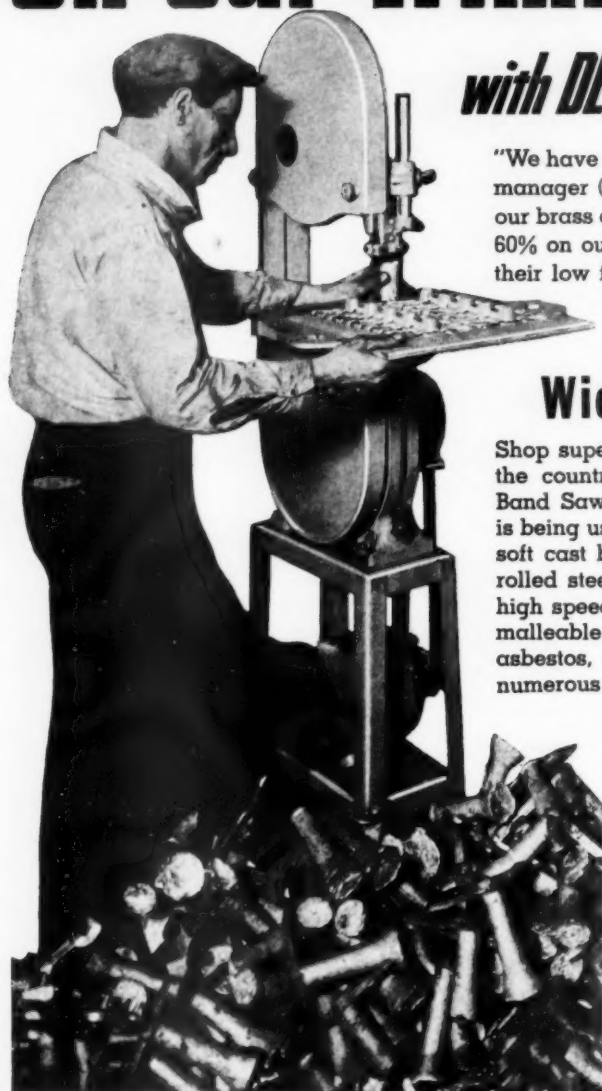
AUTHORIZED AGENTS IN PRINCIPAL CITIES

In Canada: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE TOOLS

"We Saved 60% on our Trimming Costs"

with DELTA Metal-Cutting Band Saw



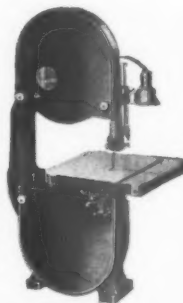
"We have three of your band saws in our foundry" says one plant manager (name on request). "We use them for sawing gates on our brass and aluminum castings. We figure that we save at least 60% on our trimming costs, by the use of these machines, due to their low first cost, their low upkeep, their small blade cost and long blade life. We don't know where we would find a machine that is so useful!"

Widely Used for Many Jobs

Shop superintendents in both small and large plants throughout the country are enthused over this remarkable Metal Cutting Band Saw. Its low price and high quality will astonish you. It is being used for cutting aluminum castings and sheets, hard and soft cast brass, brass sheets and tubing, cast iron, copper, cold rolled steel, carbon tool steel, bronze and manganese, drill rod, high speed steel, monel metal, nickel steel, iron sheets and bars, malleable iron, babbitt, bakelite and other types of molded plastics, asbestos, slate, transite, pipe and countless other materials too numerous to mention. It cuts everything from cast-iron jig and fixture bases 1½" and 2" thick to draw die segments 6" thick.

Efficient 14" Delta Wood-Cutting Band Saw

There is also available in the Delta line an unusually efficient 14" wood cutting band saw—incorporating many unusual features. It offers many advantages over other machines—plus low first cost and low operating costs. See the Delta Catalog for details and prices.



SEND FOR CATALOG

Send coupon for latest Delta Catalog and special Band Saw Circular giving full details and specifications on the Delta Metal Cutting Band Saw.

THE DELTA MANUFACTURING COMPANY (Industrial Div.)
409-G E. Vienna Ave., Milwaukee, Wis.

Gentlemen: Please send me your new Band Saw Circular giving full specifications and details on the Metal-Cutting Band Saw, and your latest Catalog.

Name

Address

DELTA MILWAUKEE

ECONOMICAL FLYWHEEL PRODUCTION IN SMALL LOTS
MADE POSSIBLE BY *Special* TOOLING ON

5 DE P & J POWERFLEX

DETAILS OF JOB

Part: Tractor Flywheel
Material: Grey Iron

Operations:

- 1st T.F.: Rough bore hole; rough bore 8.030" dia.; rough face web; rough turn O.D.; 9.188" dia. C'bore; rough turn both sides form turn 13.000" dia.; face 10 1/4" dia. of rim; face shoulder; bore 8.030" dia.
- 2nd T.F.: Finish bore hole; bore 8.030" dia.; face web; bore 9.188" dia.; face both sides at rim; face shoulder; face 10 1/4" dia.; form turn 13.000" dia.; break corners.
- 3rd T.F.: Finish face 9.188" dia.
- 4th T.F.: Ream hole 1.850" dia.
- 5th T.F.: Size turn 13.000" dia.; size bore 9.181" dia.

FLOOR TO FLOOR TIME 5.81 MINUTES -

This P&J machine is required to produce flywheels of a number of different types. P&J engineers carefully considered the necessity for rigid tooling under high production demands as well as tool life and quick change from job to job. Gripping of the part on the 7 1/8" dia. hub makes it possible to perform most of the operations in one holding of the work.

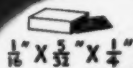
Operation and quick adjustment are such as to reduce changeover time and make possible low cost production of comparatively small lots of flywheels.

Both machine and tooling are designed for maximum rigidity and minimum vibration using tungsten carbide tools operating at maximum feeds and speeds.

THE POTTER & JOHNSTON MACHINE CO.

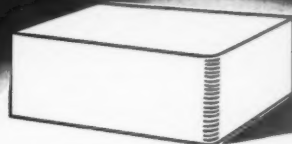
PAWTUCKET • RHODE ISLAND

Exactly The SIZE You Need..



$\frac{1}{16}'' \times \frac{5}{32}'' \times \frac{1}{4}''$

..AND ALL THE WAY BETWEEN..



$\frac{1}{2}'' \times \frac{3}{4}'' \times \frac{1}{4}''$

How to make your own FIRTHITE Tools



Recess Tool
Steel Shank
to take
Firthite "tip"

Shape Firthite
"tip" to fit
shank recess



Braze Firthite
"tip" into
shank recess

Grind clear-
ance angles
on assem-
bled tool



A FIRTHITE TIP FOR EVERY TOOL!

From the tiny but effective FIRTHITE Tip, $\frac{1}{16}'' \times \frac{5}{32}'' \times \frac{1}{4}''$, to the husky blank, $\frac{1}{2}'' \times \frac{3}{4}'' \times \frac{1}{4}''$... and in hundreds of sizes all the way between ... you can select a size, shape and grade of FIRTHITE Sintered Carbide Tip to meet your every tool making need.

The recent addition of 176 NEW Standard Tip Sizes results in a wide range of 249 sizes embracing almost the whole field of single point tool requirements and a large variety of special tools as well. Increased production facilities assure prompt delivery of both standard and non-standard tips of all sizes.

Join the increasing group of manufacturers who avoid carbide cutting tool delays by making their own FIRTHITE Tools with Firthite tips. If you have not already received one, ask for the new STANDARD TOOL TIP SIZE AND PRICE LIST today!

FIRTH-STERLING

STEEL COMPANY

OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT



MONARCH LATHES



Monarch ~~EXPANSION TIME~~ makes an automatic machine out of any size engine or tool room lathe.

COVER THE TURNING FIELD



Monarch Model "C" Tool Room Lathes—available in 12", 14", 16", 18" and 20" sizes.



Monarch ~~EXPANSION TIME~~ Lathe—performs functions of many machines—is today's most universal automatic lathe.

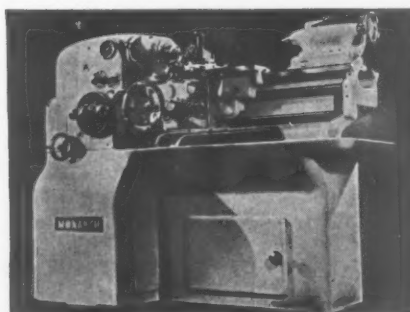


Monarch 5-T Manufacturing Lathe—handles a variety of manufacturing jobs or a single quantity production job.

MORE and more, one name comes quickly to mind when you think of lathes—the last word in lathes—MONARCH.

It is the symbol of progress, of technical advancement, of forward thinking. If a job is to be turned, it is likely that one of the many sizes and types of Monarch lathes will do the job better, faster, and at lower cost per piece. Monarch engineers can bring to your turning problems a wealth of experience gained during 31 years of broadening the scope of lathe production. The Monarch Machine Tool Company, Sidney, Ohio, U. S. A.

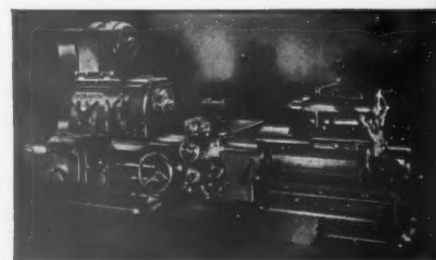
**"Expansion Time" Lathes By Monarch
Will Do Tomorrow's Competitive Job.**



10" Sensitive Precision Lathe—this 2,000-pound, 3 H. P. lathe fills a long-felt want in the Tool Room.



Monarch-Keller—For form turning, boring and facing. Incorporates many advancements which make it the most universal machine ever engineered.



Monarch Engine Lathe—available in these sizes: 12", 14", 16", 18", 20", 22", 24", 27", 30" and 36".

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Chicago Sales Office: 622 West Washington Boulevard • Indianapolis Sales Office: 3910 E. 57th Street • Newark Sales Office: 1060 Broad Street • Pittsburgh Sales Office: 604 Chamber of Commerce Building • Agencies in principal industrial centers of this and foreign countries

HAYNES STELLITE MILLING CUTTER BLADES

For High Production at Low Cost

HAYNES STELLITE standard milling cutter blades are carried in stock for immediate delivery. These blades are widely used in the production milling of cast iron parts such as automotive cylinder blocks and heads, crankcases, and manifolds—because they have long life between grinds, at high speeds and fast feeds. High production is thus obtained at low cost per piece machined.

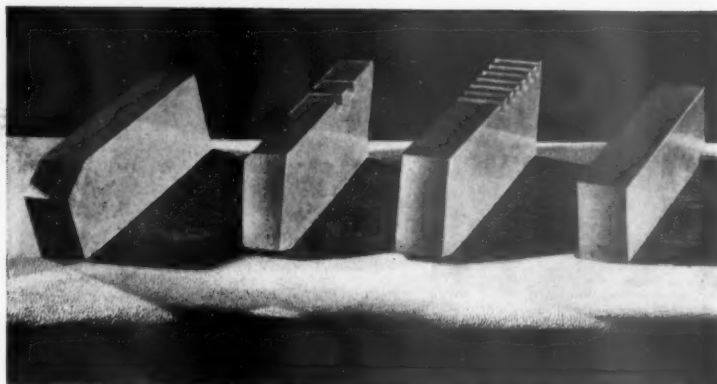
OTHER STANDARD TOOLS

Haynes Stellite standard *tool bits* are also stocked in a variety of sizes for immediate delivery, finish-ground for use in standard tool holders. Since each size can be easily ground to any required profile, tool inventory can be kept at a minimum. A large variety of standard *welded tip tools* is also available for quick delivery.

SPECIAL TOOLS ON ORDER

Special tools—including solid bits, welded tip tools, milling cutter blades, brazed-in blade shell end mills, grooving and form tools, boring and reaming blades, spot facers, and counterbores—are supplied to users' specifications.

Consider the advantages of Haynes Stellite tools for the jobs in your shop and get in touch with the nearest Haynes Stellite office today.



AVAILABLE FOR IMMEDIATE DELIVERY

The Haynes Stellite standard milling cutter blades listed below are available from stock. They are supplied finish-ground with tolerances of plus 0.001 in., minus 0.000 in. on thickness; plus 0.005 in., minus 0.000 in. on width; and plus 1/32 in., minus 0.000 in. on length. For best results, these blades should be used in hardened steel cutter bodies.

STANDARD MILLING CUTTER BLADES

Type	Thick- ness in.	Width in.	Length in.	Angle, deg.	Haynes Stellite Blueprint
Ingersoll	0.297	5/8	2 1/2	10	D8818
	0.344	3/4	2 9/16	20	D7143
	0.344	3/4	2 3/4	30	D14965
Kearney & Trecker Right Hand Left Hand	0.344	3/4	2 9/16	18	D13563-Detail 1
	0.344	3/4	2 9/16	18	D13563-Detail 2
Modern	0.312	3/4	2 47/64	15	D6082
	0.375	3/4	2 47/64	15	D6081
Production	0.375	5/8	2 13/16	15	D1806
	0.375	1	2 13/16	15	D1805



*Red-hard, wear-resisting alloys of
cobalt, chromium and tungsten*

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation



New York, N. Y.

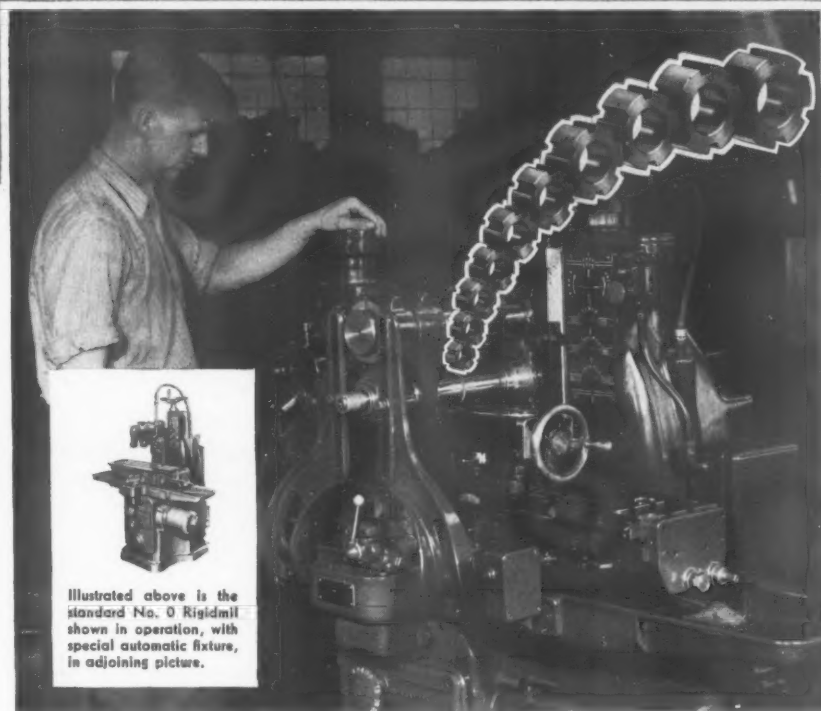
Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

HIGH-PRODUCTION METAL-CUTTING TOOLS

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company

Engineered Production



Illustrated above is the standard No. 0 Rigidmil shown in operation, with special automatic fixture, in adjoining picture.

Rigidmil Boosts Hourly Output 60% Holds Accuracy to $\pm 0.0002''$

★ More production was required on milling grooves in steel rollers, $\frac{5}{16}''$ face by $\frac{3}{4}''$ diameter, mounted five on an arbor. Dimensions, shape and spacing of grooves are all held to $\pm 0.0002''$, a "fussy" job and hard work by the old method.

How Sundstrand Increased Output. Engineered Production put this job on a Number 0 Hydraulic Rigidmil with automatic hydraulic indexing fixture as shown above, and boosted hourly output 60%. Duplicating the equipment doubled the new production, and that meets present requirements. Operator now merely puts an arbor-load of blanks in place, starts the Rigidmil automatic cycle and goes about his other work. He runs the two Rigidmils easily, pro-

duces 220% more rollers than he did before. The parts are all within the required limits of $\pm 0.0002''$ so reliably that costly inspections formerly required are now eliminated.

Other Uses . . . At any future time these Rigidmils can be used for economical accurate high production on a wide variety of other work-pieces and metals. They can saw, slot, end-mill, side-mill, slab-mill, take special multiple-spindle heads, climb-cut, as well as conventional mill in many automatic and semi-automatic cycles. Yes, these same Rigidmils!

For Your Work . . . Use Sundstrand Engineered Production to meet today's demands economically, and to protect your machine tool investment later.

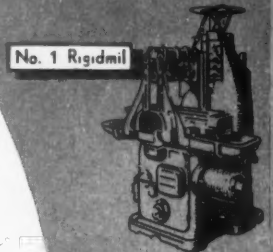
Sundstrand Machine Tool Co.
2532 Eleventh Street, Rockford, Illinois, U. S. A.



No. 00 Rigidmil



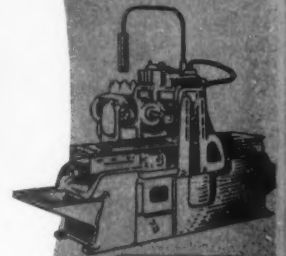
No. 0 Rigidmil



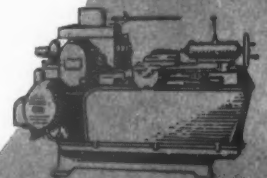
No. 1 Rigidmil



See bulletin shown above for complete description of No. 0 Rigidmil including hydraulic feed and hand feed types. Write for your copy, today. Ask for Bulletin 382.



Fluid-Screw Rigidmil



Model 12 Automatic Stub Lathe



Model 8 Automatic Stub Lathe



Model 10 Automatic Stub Lathe

In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details



RIGIDMILS · STUB LATHES

Hydraulic Operating Equipment — Drilling and Centering Machines



Experience of Years

STORED UP

in Helpful Literature...

The pressing demands of the defense program call for the employment of every skill and facility at the disposal of the metal working industries.

Among the resources available is the experience of our technical staff in the solution of problems involving the use of Nickel and its alloys.

This experience has been distilled into helpful literature which deals with the selection, fabrication and uses of these materials. This printed matter is yours for the asking. You are also offered the assistance of our technical staff in solving problems of material arising from the temporary lack of Nickel.

Your inquiries addressed to the Company either for literature or personal consultation will receive prompt attention.

Nickel

THE INTERNATIONAL NICKEL COMPANY, INC.

**67 WALL STREET
NEW YORK, N. Y.**

THE TOOL ENGINEER

MAKING AMERICA SAFE

... *with* Precision Machine Tools

SUCCESS of the vast effort to attain national security is based directly on how swiftly manufacturers can produce . . . produce without any sacrifice of those standards of accuracy that have made mass production of interchangeable metal parts a distinct American accomplishment. *Ex-Cell-O's place in the great emergency is obvious.* As one of the nation's leading builders of machine tools, its high-precision products have for years contributed to the increasing of metal working efficiency . . . today, practically every branch of modern industry depends upon them when accuracy, speed, economy are the requirements. The same superior skill and experience that made these Ex-Cell-O achievements possible in the past . . . that have made Ex-Cell-O a common word for precision wherever machine tools are used . . . are willingly pledged to the great task now placed upon them—to serve American industry to the ultimate degree of human power in the supreme job of protecting America.

EX-CELL-O CORPORATION • DETROIT, MICHIGAN



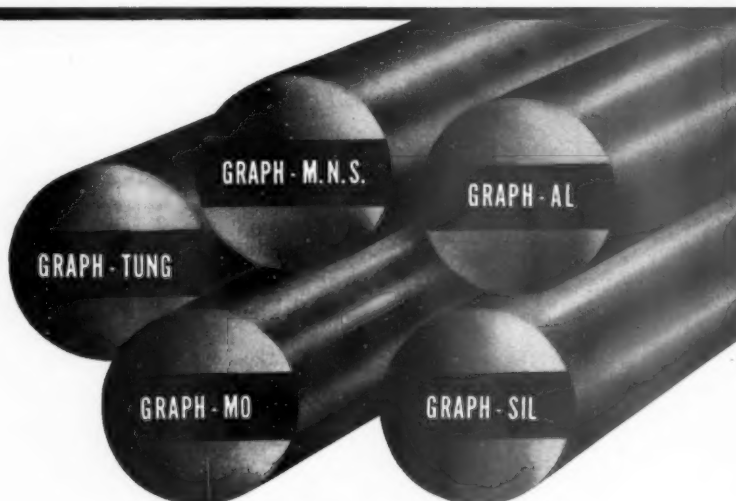
**DEFEND
AMERICAN
FREEDOM
IT'S EVERYBODY'S JOB**

NATIONAL ASSOCIATION OF MANUFACTURERS



Precision THREAD GRINDING, BORING AND LAPPING
MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRIND-
ING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS

★ **T**wo ways to speed up **Defense Production . . .**



★ **MORE TOOLS**

You no doubt have thought of this method before. We hope you have been successful.

★ **GRAPHITIC STEELS**

Perhaps you're using them now. We hope you are. They machine 25% faster than comparable steels and wear longer.

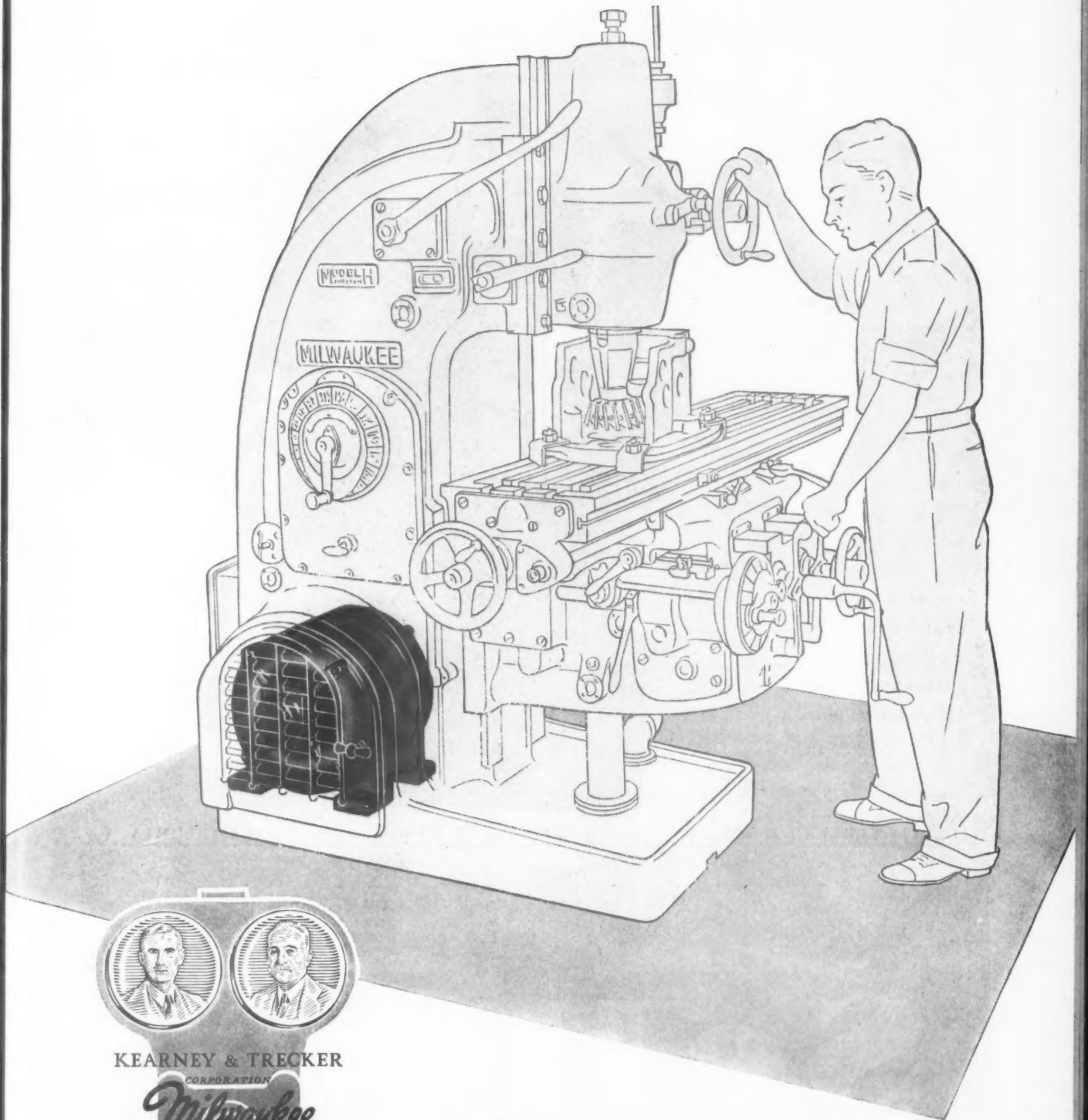
Write today for the newly revised and enlarged 5th Printing of the Graphitic Steel Booklet.

**THE TIMKEN ROLLER BEARING
COMPANY, CANTON, OHIO**
Steel and Tube Division

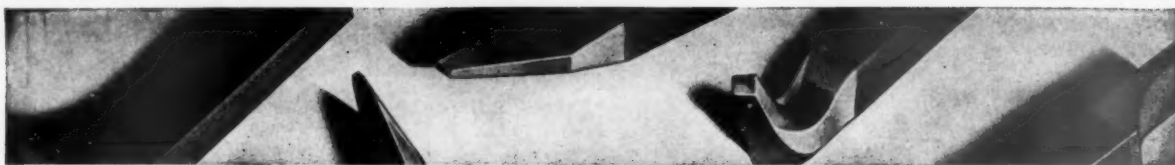
TIMKEN *ALLOY STEELS*

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

Cross-mounting of the motor contributes substantially to the rigidity of Milwaukee Milling Machines and assures a smooth, vibration-free flow of power at all speeds and feeds. Side-mounting permits machine to be placed back-to-wall. KEARNEY & TRECKER CORPORATION • Milwaukee, Wis., U. S. A.

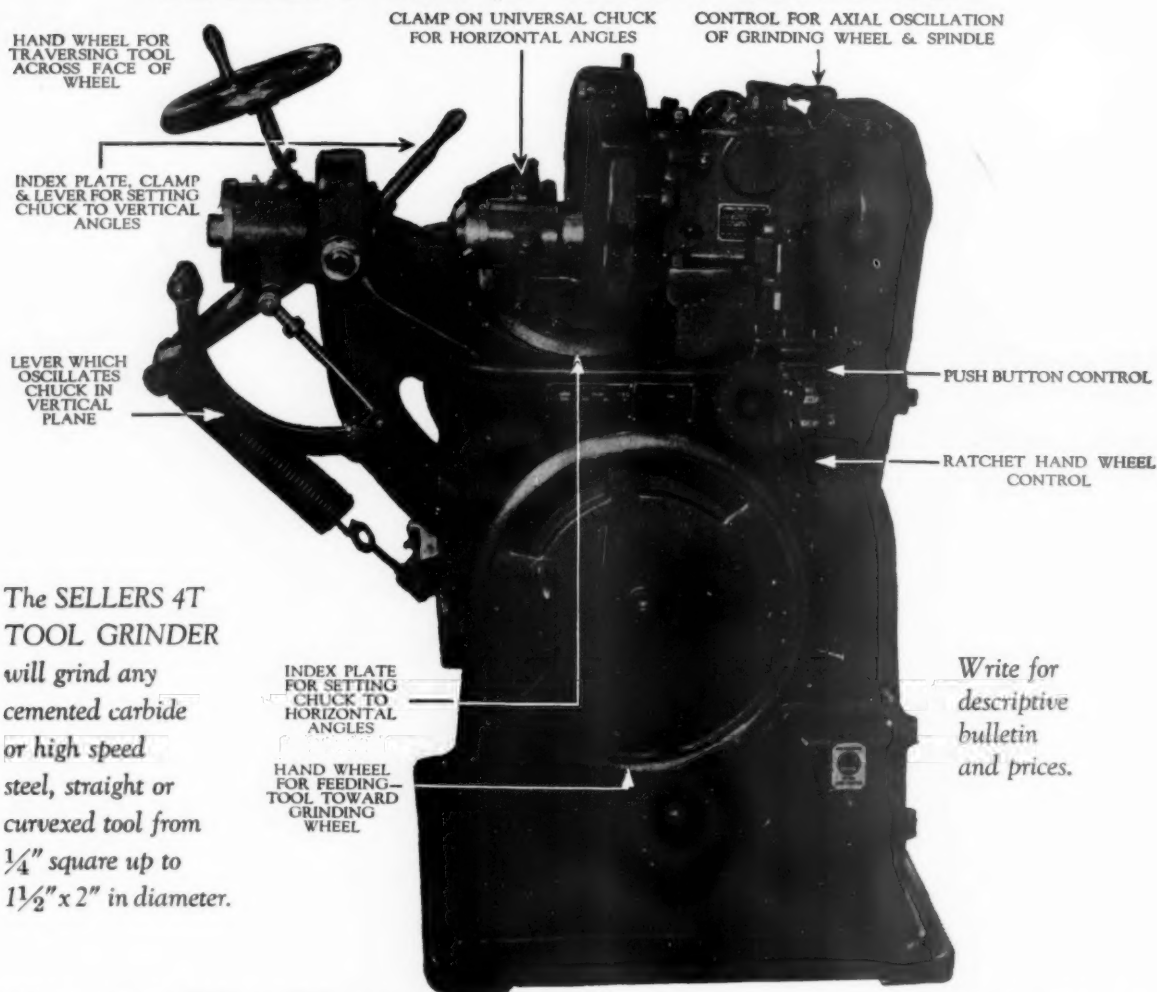


MILWAUKEE MILLING MACHINES



KEEP PRODUCTION AT PEAK!—GRIND TOOLS ON SELLERS TOOL GRINDERS

SELLERS No. 4T TOOL GRINDER



The SELLERS 4T TOOL GRINDER will grind any cemented carbide or high speed steel, straight or curved tool from $\frac{1}{4}$ " square up to $1\frac{1}{2}$ " x 2" in diameter.

Write for descriptive bulletin and prices.

WILLIAM SELLERS & CO., INCORPORATED • 1626 Hamilton St., PHILADELPHIA, PA.

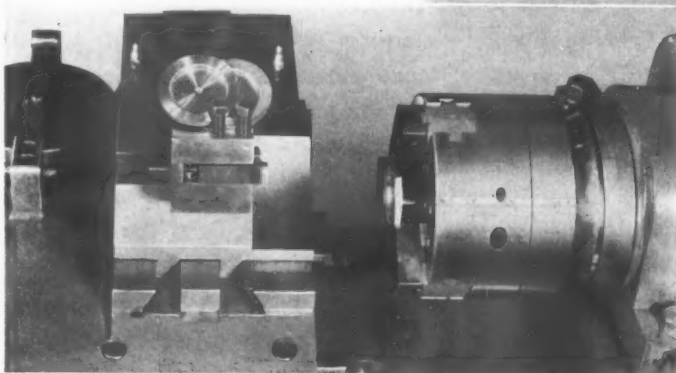
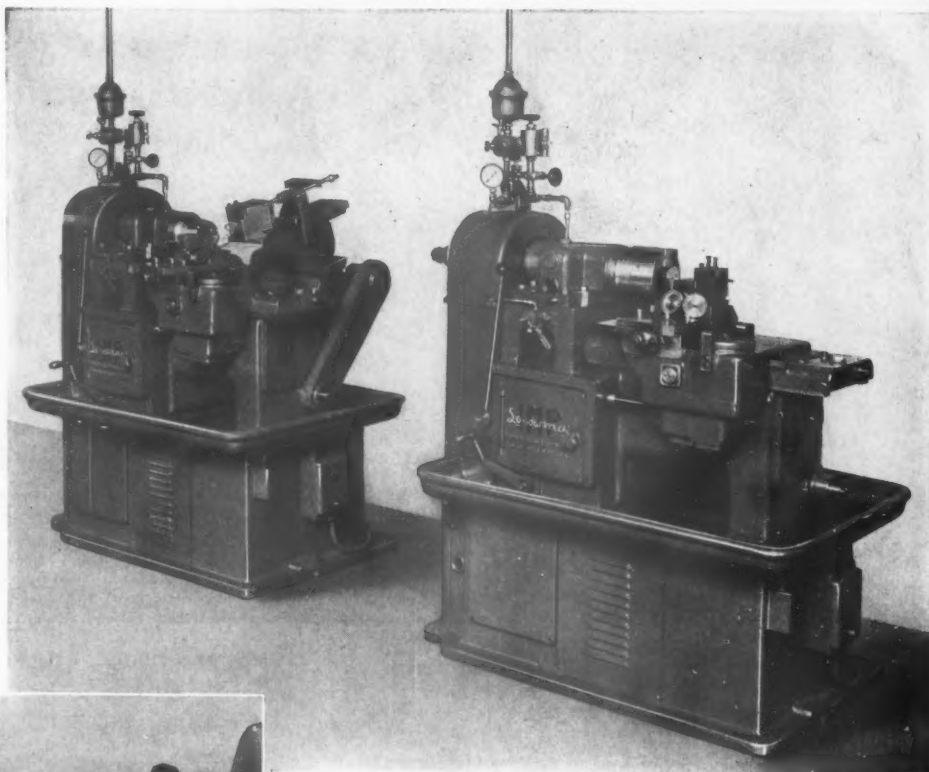
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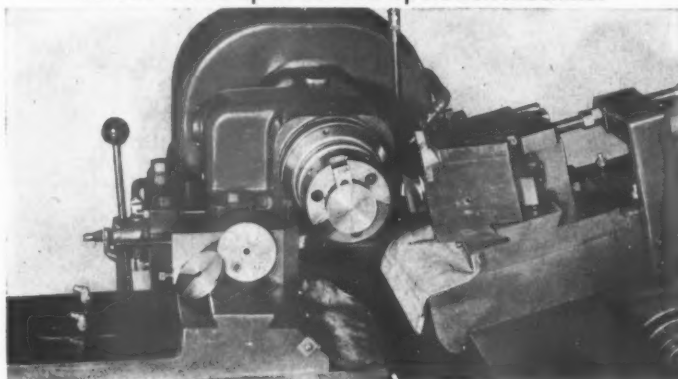
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-Swing PEOPLE" SENECA FALLS, NEW YORK

IMP LATHES MACHINE INTERNAL GEARS ON TWO-OPERATION SET-UP



Above: Close-up of first-operation machine.
Below: Close-up of second-operation machine.



PROBLEM: To face, undercut, turn and groove bronze internal gears on a production basis.

SOLUTION: Two Lo-Swing IMP Lathes were selected for this job since the size of the work (2 5/16" dia. x 3/16") was within the capacity of these high-speed machines. The first-operation IMP, seen at right above, locates the work from a previously-bored hole. An air-operated, compensating chuck grips it on the O.D. Tools on the front cross slide face and undercut.

The second-operation IMP machines the reverse side of the gear, again locating from the hole and driving with a compensating, internal jaw chuck. A tool on the front carriage turns the O.D. while tools on the back attachment face and groove. The facing tool relieves on the return stroke so as not to score the work.

Estimated production is 185 pieces per hour on the first-operation machine and 160 on the second—at 85% efficiency. All tools are cemented carbide.

LATHE NEWS from SENECA FALLS

Does Your DEFENSE JOB Require—



- ★ Grinding and finishing of internal cylindrical surfaces from .185" to 2.400"?
- ★ Precision limits within .0001"?
- ★ Super-smooth surface finish?

If so, you'll find the answer in

The SUNNEN Model "MA" 4-Speed PRECISION HONING MACHINE

For Example:—

Leading companies in these fields are using the Sunnen Precision Hone:

Aviation	Machine Tool Builders
Aviation Machine Shops	Machine Rebuilders
Automobile Mfrs.	Marine Engines
Air Hammers	Motorcycle
Air Compressors	Motion Picture Equip.
Air Vibrators	Optical Mach.
Ball & Roller Bearing	Oil Well Equip.
Bronze Bushings	Office & Store Equip.
Coal Machinery	Pump Mfrs.
Can Machinery	Piston Mfrs.
Chemical	Printing Mach. & Equip.
Diesel Engine Rebuilding	Rubber Machinery
Diesel Fuel Injectors	Road Mach. Equip.
Die Set Mfrs.	Refrigeration Equip.
Die Casting Machinery	Shipbuilding
Drill Bushing Mfrs.	Shoe Mach. Mfr.
Electrical Equipment Mfrs.	Steam Shovels
Food Machinery	Weighing Scale
General Machine Shops	Stampings & Drop Forging
Government Arsenals	Screw & Bolt Mfrs.
Governor Mfrs.	Steel Mills
Gauge Mfrs.	Sewing Mach. Mfr.
Glass Machinery	Steam Turbine Mfrs.
Gyroscope Mfg.	Tool & Die Shops
Hydraulics	Textile Mach.
Instruments	Vacuum Cleaner Mfr.
Lubrication Equip.	

In this one simple, practical, inexpensive machine you have the answer to the problem of accurately sizing and finishing internal cylindrical surfaces from .185" to 2.400" in diameter. Many manufacturers engaged in the defense program have said that they are amazed that such a low cost machine can produce such accurate work.

It saves you time in training new workers, too. It doesn't take a skilled machinist to operate the Sunnen Precision Honing Machine. Any intelligent workman with a few hours' practice can produce super-smooth surface finishes and hold accuracy to within .0001".

This machine can be set up and work located in less than one minute. Corrects taper and out-of-round conditions and defects in previous machining operations.

If you have an internal sizing or finishing problem, it will pay you to get complete information today. Write for free 8-page bulletin — or if you prefer, a sales engineer will be glad to call and demonstrate in your shop what this machine will do for you.

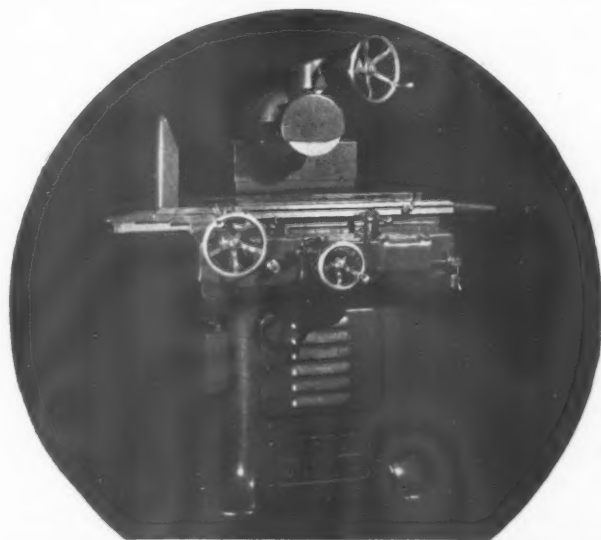


SUNNEN PRODUCTS CO.,

7932 Manchester Ave., St. Louis, Mo. — Canadian Factory: Chatham, Ont.



For Fast, Accurate Grinding in the Tool Room or on Production - - - The NORTON 6x18"



FOR those exacting flat tool and die jobs specify Norton Surface Grinders. The popular 6 x 18" machine is furnished with a plain bronze or an antifriction bearing wheel spindle—for hand or hydraulic operation—with coolant service for wet grinding or with an individual dust exhaust system. In hundreds of tool rooms as well as on the production line they are highly regarded for their accuracy, dependability and ease of operation. Send for descriptive circular No. 954. No obligation, you know.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Cleveland Hartford

M-437

NORTON GRINDERS

**We're meeting the tungsten shortage
with a
GOOD, DEPENDABLE
HIGH-SPEED STEEL**

Having foreseen the present tungsten shortage, Bethlehem has developed, tested and perfected a high-speed tool steel to replace high-tungsten 18-4-1 grades.

This fine steel is called Bethlehem H-M High-Speed. H-M High-Speed is ready and able to take over the jobs formerly handled by 18-4-1 grades. It will do the work just as well, if proper care is taken in heat-treating. Moreover, this steel is less expensive than 18-4-1. A typical analysis of Bethlehem H-M High-Speed is as follows:

C=.78 S=.017 Mo=8.70

Mn=.25 Si=.25 W=1.55
P=.017 Cr=3.70 V=1.10

Heat-treatment tips:

Because of its different analysis, H-M High-Speed requires different heat-treatment practice than other high-speed steels. For best results, the following recommendations should be carefully followed:

1. Hardening—Hardening temperature depends on carbon content and type of service required of tool or die. For cutting tools, use a hardening temperature of at least 2200° F.;

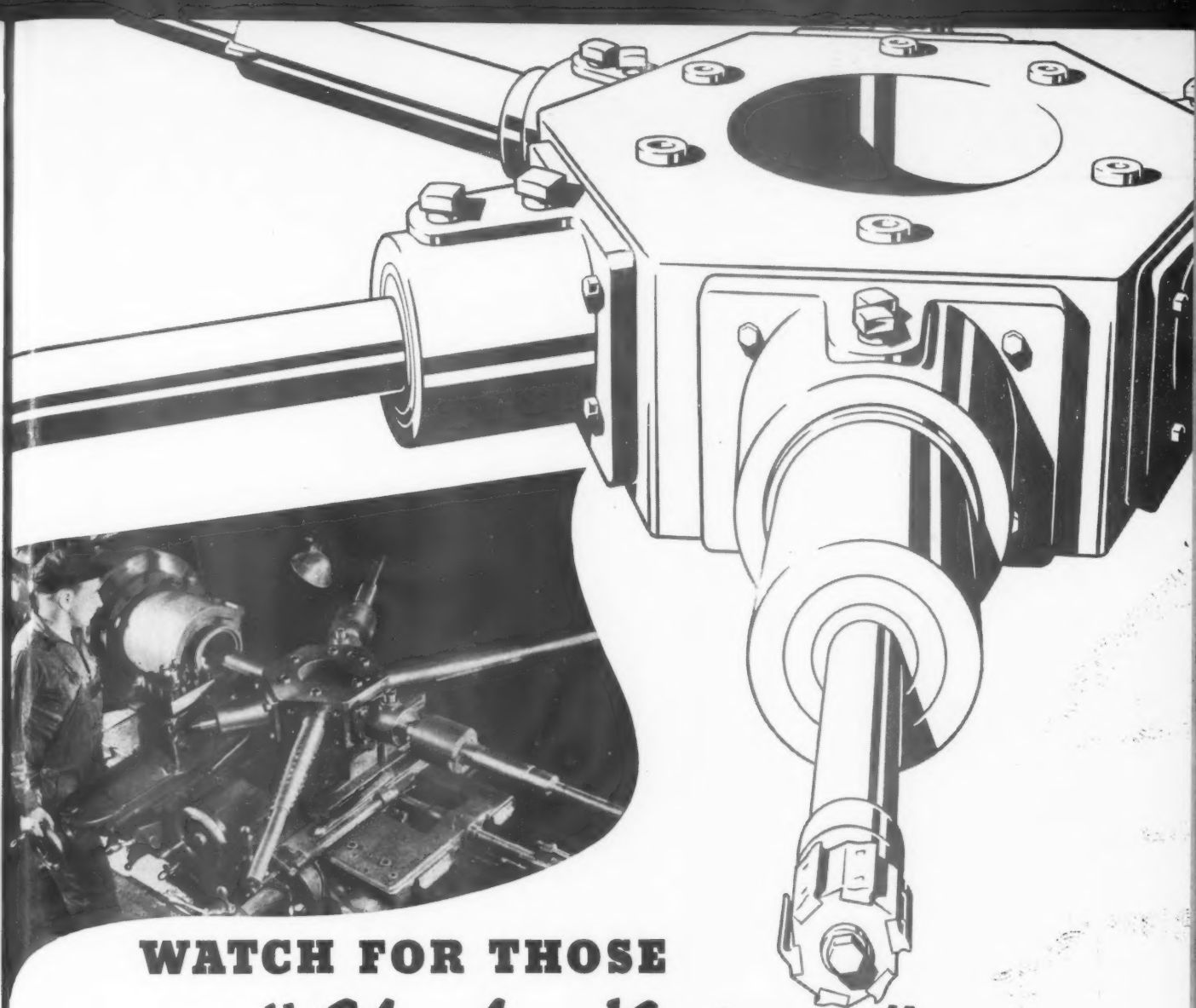
2240° F. is generally recommended. Do not hold a piece too long at hardening temperature (1 minute for a 1-in. round) as long holding will coarsen the grain.

Precautions should be taken to avoid decarburization on tools which cannot be ground after hardening. Non-oxidizing furnace atmospheres, salt baths, or borax coatings are used.

2. Tempering—A tempering treatment at 1050° F. will produce the highest secondary hardness in H-M High-Speed, if it has been correctly quenched.

BETHLEHEM STEEL COMPANY





WATCH FOR THOSE

"Choke Points"

IN PRODUCTION

Now that the pace of production is faster, those "choke points" show up more clearly than ever. Plan now to do something about them! If your old equipment can't keep pace today, it will be still more penalizing in the days that lie ahead.

If it's metal turning, your production can be accelerated by one of the new Gisholts. So rapidly have improvements taken place in Gisholt Turret Lathes that

they are increasing production as much as 50% over the machines of a few years ago. That increased speed and accuracy will be an important factor in your future profits.

For more than a half-century, Gisholt developments have been coming in a steady procession, each one bringing simpler operation, greater speed, and lower cost. It pays to keep up with them!

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If turret lathes, drill presses and milling machines are the heavy artillery of production . . . reamers, drills and cutters are the shock troops upon which the success of the drive depends. So put only top quality cutting tools at the workhead. Use MORSE tools to get your production drive under way . . . and keep it going strong.

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... and also reduce your tool cost!

Vital Facts About Carboloy STANDARD STOCK Tools & Tips!

Here are three ways in which you can obtain your Carboloy tool requirements in the fastest, most efficient and most economical way under present conditions:

1 Use Carboloy Standard Stock Tools. These are made in "mass production" quantities and are stocked and shipped by the thousands each week. You always get them faster than "specials". A check-up of your Carboloy tool needs will reveal many that can be easily changed over to standards. You save weeks of delivery time.

2 Use Carboloy Standard Blanks. These, too, are made in "mass production" quantities. If a thorough check reveals that you can't use Carboloy Standard tools (most users find they can), ask your tool designers to incorporate Carboloy Standard Blanks in their special tools whenever possible. This saves production time.

3 For emergency tooling braze your own Carboloy tools. Many users keep a supply of Carboloy Standard Blanks ready for emergency tooling and repairs. Many, too, braze ALL their own Carboloy tools.

Carboloy Standard Tools consist of the 10 styles shown at right, suitable for, or adaptable to, 60% to 80% of all turning, facing, boring applications. In cases where these tools, as supplied, do not exactly meet design requirements, you will find your tool room can usually grind variations to meet a wide range of special angles and shapes.

Generously sized Carboloy tips, plus modern rapid Carboloy grinding technique, make this procedure practical and fast. By this method you can take advantage of the greater economy and faster delivery of Carboloy Standard Tools—often WEEKS faster than "specials"!

Carboloy Standard Blanks, too, save time and money. Two styles (shown lower right) available in 65 sizes, three grades.

A few minutes spent to get the facts about Carboloy Standard Stock Tools and Blanks may save you weeks of delivery time. Send for Catalog GT-129.



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Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

STYLE T-1



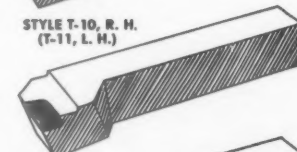
STYLE T-4, R. H.
(T-7, L. H.)



STYLE T-5, R. H.
(T-9 L. H.)



STYLE T-10, R. H.
(T-11, L. H.)



STYLE T-12



STYLE T-13, R. H.
(T-14, L. H.)



Standard Blanks
in 65 Sizes
2 Styles, 3 Grades

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STANLEY BENCH GRINDERS—for buffing, wire brush work, polishing, tool sharpening and light grinding. 6 models— $\frac{1}{4}$ to 1 H.P.—wheels from 6" x $\frac{1}{2}$ " to 10" x 1". Grease-sealed ball bearings. Safety type wheel guards.



SPEED UP GRINDING on heavy work. Instead of trucking or carrying it to a stationary machine, put a Stanley Portable Grinder on the job. 2 models—5" or 6" wheels—ball bearing.

INSTEAD of letting slow delivery on "big machines" bog you down, here's a way to get the work out. For drilling, grinding, sheet-metal cutting, assembling and other similar jobs use Stanley Electric Tools. A nearby Stanley distributor will show you how these low-cost, rugged tools will relieve you on many jobs and pay for themselves time and time again.

The line includes Stanley Unishers for fast, accurate cutting of sheet materials; Toolroom, Contour, Bench, and heavy Portable Grinders; Electric Hammers, Drills, Screw Drivers and Saws. Ask your Stanley distributor to demonstrate, or write for literature. Stanley Electric Tool Div., The Stanley Works, 143 Elm St., New Britain, Conn.

STANLEY
Electric Tools



SNAGGING CASTINGS with a powerful, precision-built Stanley Sander and Grinder. Also used for grinding heavy steel welds; for sanding, buffing, surfacing on wood, metal or concrete.



30% MORE VISIBILITY. New Stanley "Flud-lite" Safety Eye Shield has 6" x 4" window of safety glass. Two long-life frosted bulbs give ample, shadowless lighting. Guard is adjustable from horizontal to a 45° angle for use either standing or sitting.

Manning, Maxwell & Moore, Inc. Choose DAVIS BORING TOOLS for

Flexibility!



The flexibility of Davis Block Type Boring Tools is enthusiastically praised in machine shops everywhere. The above photograph illustrates how the flexible features of Davis Tools permit multiple machining operations in the Bridgeport, Conn. plant of Manning, Maxwell & Moore, Inc.

In this turret lathe setup, Consolidated Safety Valves are machined. This involved a special design Davis Boring Tool, for rough and finish boring, facing seats and chambers, and finishing surfaces on the valve base. Manning, Maxwell & Moore are highly pleased with the ease with which accurate tolerances, concentricity, and diameter of bores are maintained with these Davis Tools, in addition to reduced boring costs.

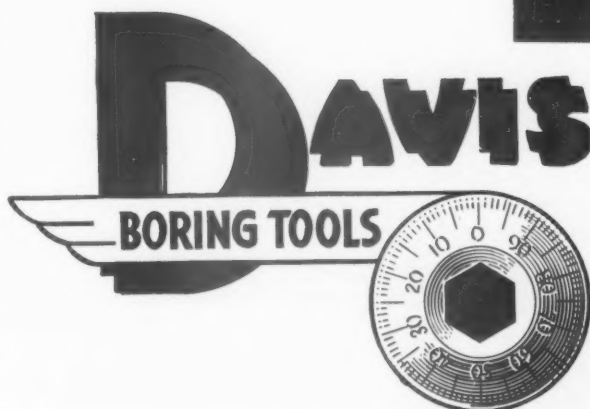
Send us prints of YOUR special boring job, for a specific, helpful recommendation. No obligation.

DAVIS BORING TOOL DIVISION

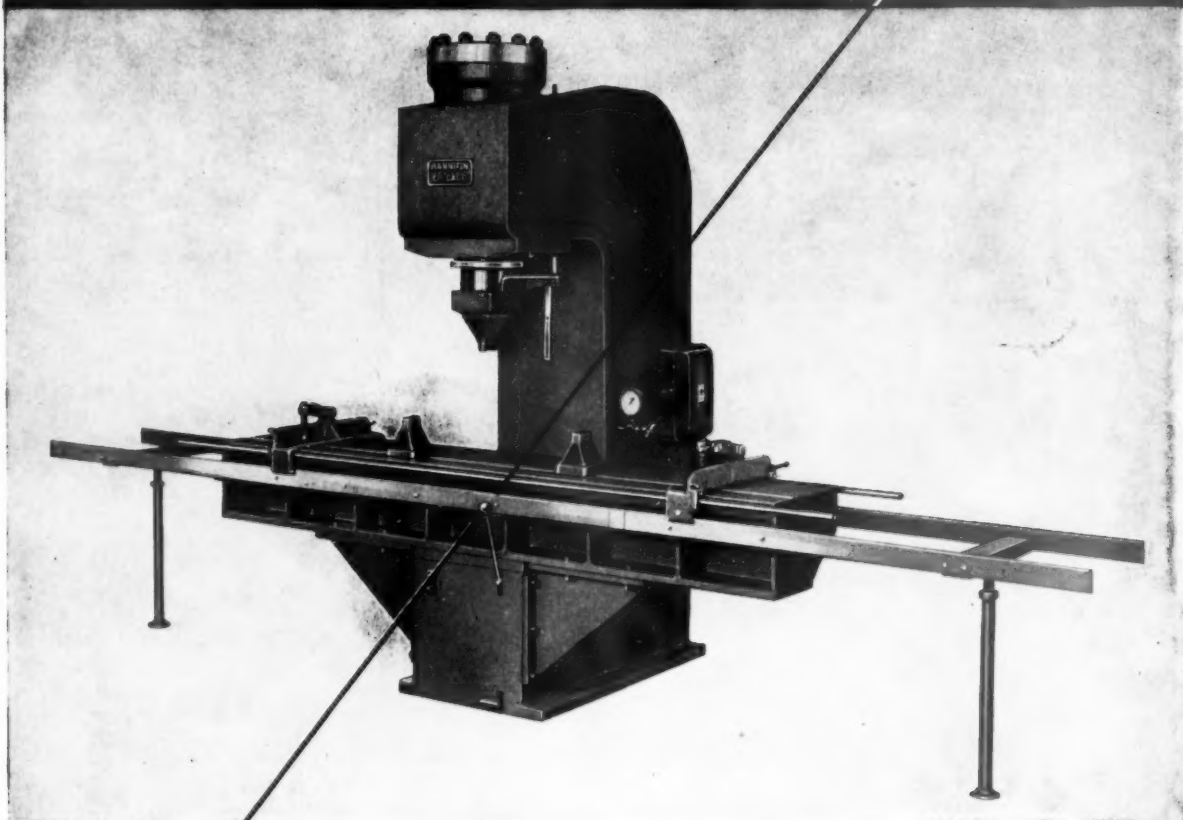
Larkin Packer Co., Inc., St. Louis, U.S.A.



DAVIS BLOCK TYPE TOOLS . . . for amazing new standards of Accuracy, Speed, Flexibility and Economy. Specially Designed for All Types of Boring.



A 75-Ton Push



at your finger tips...

Straightening operations are made faster, easier, and more accurate on Hannifin Hydraulic Presses equipped with the exclusive sensitive pressure control. This new kind of control is so simple and natural that the operator literally has any pressure up to full capacity of the press available at a touch of the fingers. Ram pressures, not stroke, are under infinitely variable control by either hand lever or foot pedal.

Initial lever movement gives a rapid approach stroke at nominal pressure. Further lever movement causes increasing ram pressure, up to full capacity. Release of the lever gives a rapid return stroke to top ram position. The motor-driven hydraulic power unit idles at zero pressure between cycles.

Because complete and sensitive control of ram pressures is so simple, handling of work is easier and the operator's skill can be devoted to accurate straightening operations at high production rates.

Hannifin hydraulic presses are complete, self-contained units. Many types are available for straightening, press-fit assembly, and similar work, in capacities from 5 tons to 200 tons. Consult Hannifin engineers, or write for bulletins with specifications.

The press illustrated is 75-ton capacity, reach 18 in., table 120 in., fixture rails 18 ft.

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4829 Woodward Avenue, Telephone Columbia 4949

HANNIFIN Hydraulic Presses

Work Relief-1941 Style

A HEADLINE in an eastern paper proclaiming that "Increased Production Imperils Relief Projects" has been the cause of some amusement and comment. A psychologist might find cause for worry in the state of mind of a people that viewed with alarm such a curtailment of relief work, but we believe that most Americans will bear the loss of relief projects bravely.

If, however, our Government feels that it must give relief to someone there are other channels to which its efforts might be turned.

The same increase in production that is putting the jobless back to work is erecting new factories which will consume vast quantities of fuel and raw materials. We now realize that to supply these plants with their wants is going to cause a curtailment in consumer production. It is likely that the workers in such plants can pick up their tools and go elsewhere, to readily find employment in defense industries.

But the owners of such plants cannot pick up their capital and go elsewhere. Picture the situation, for example, of a firm which has long been engaged in the manufacture of aluminum cooking utensils. Now that aluminum must be used for more deadly purposes, this firm finds itself suddenly without raw materials, without products, and without profits. All that remains is the plant, the idle machinery, the overhead.

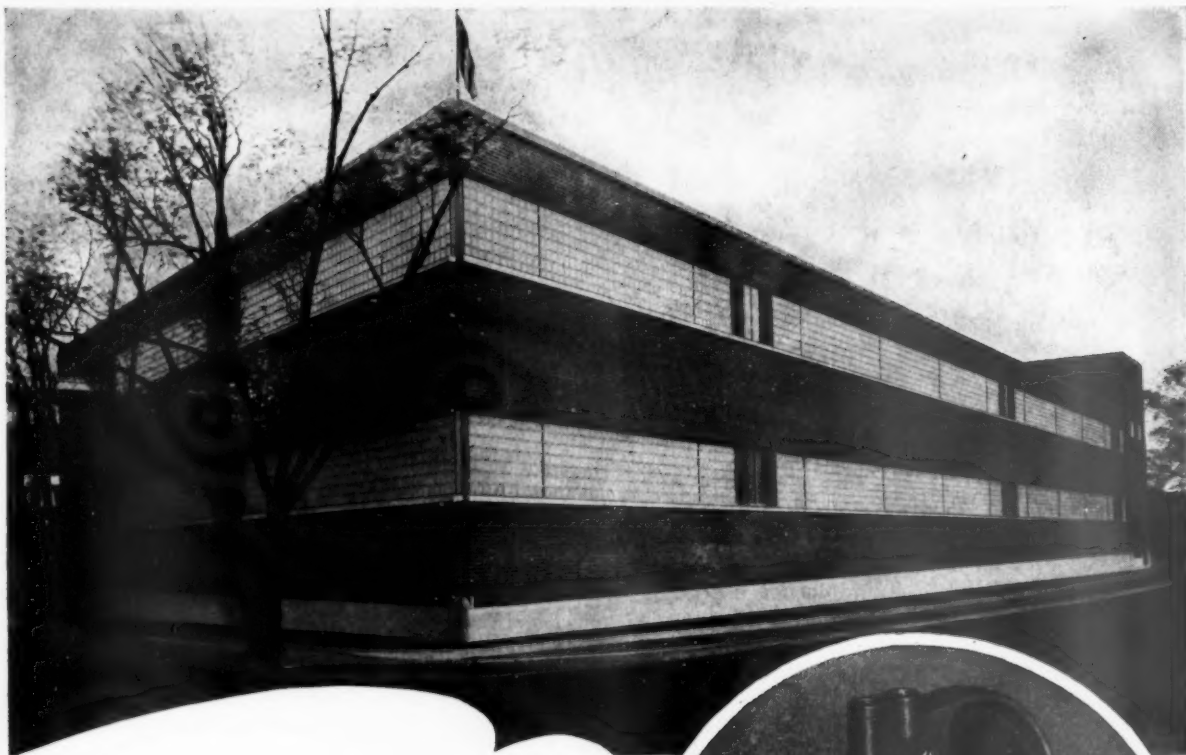
This is more or less a hypothetical case, but there are actually several concerns in roughly this position because aluminum is no longer available for cooking utensils. There are many other concerns who are in the same position because of other shortages.

The managers of these firms are resourceful—they have had to be to remain in operation during the past decade. They are seeking new products—usually defense products—which they can produce in their plants without prohibitive alterations.

Government awards are largely going to the biggest companies—it is quicker and more efficient that way. These companies are doing a lot of sub-contracting, more than most people realize.

But the sub-contracting is not filtering down fast enough or far enough. Here is a chance for Government to be of real help by seeing that the capacity of plants and machine tools made idle by consumer curtailments is utilized for defense production.

If this is not done there will be no boom for many small industries—there will be only bankruptcy. Only bankruptcy for firms whose potential production is vitally needed for defense today and will be essential as well to a successful post-war reconstruction.

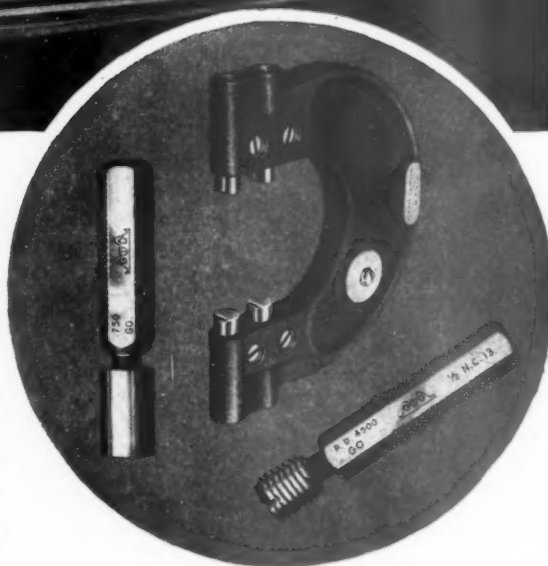


NEW HOME for "GREENFIELD" Gages

MEMORIAL DAY at "Greenfield" was marked by the opening of this new modern air-conditioned plant, devoted entirely to the manufacture of Plain, Thread and Limit Snap Gages. It will more than double "Greenfield's" gage manufacturing capacity and symbolizes "Greenfield's" determination to cooperate in every way with the national defense program.

The most modern machinery and complete air conditioning will materially assist our hundreds of trained and experienced gage workers to maintain the closest possible control over manufacturing conditions. Even with the greatly enlarged output that the new building makes possible, individual quality and accuracy will be maintained and increased.

36



Increased research and testing facilities are an important part of the new equipment and will be used unceasingly for the benefit of our friends and customers.

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THE TOOL ENGINEER

Canada's Wartime Production



"Put your confidence in us. Give us your faith and your blessing, and under Providence all will be well. We shall not fail or falter; we shall not weaken or tire. Neither the sudden shock of battle nor the long drawn trials of vigilance and exertion will wear us down. Give us the tools and we will finish the job."

Winston S. Churchill

Illustration Courtesy Canada Illinois Tools Ltd.

The Universal carrier illustrated here is versatile in application. It is now produced in large quantities



throughout Canada, and is only one of many items of wartime production.

What is Canada Doing in War Production?

By R. E. CRAWFORD
Editor, Canadian Machinery & Manufacturing News

WITH the convulsive changes of pace which have marked the progress of the war, Canadian production of the vital mechanical equipment and the purchasing machinery at Ottawa have undergone swift alterations, so far, always at a rapidly accelerating rate.

The placing of orders has of course preceded production all along, and is now a vastly different process from that which prevailed in the civil service of peace-time. A complicated tender requirement ("from all available sources") which demanded the lowest bid and yet required limitation of profits to 5% featured the first control, set up two months before the war. This had early to be abandoned and has now developed into a rational high speed system, centralizing purchasing in the Department of Munitions and Supply, which is housed in two hurriedly erected frame buildings and employs over 1600 people, 70 or more serving without remuneration.

Purchases are made from all industries, in Canada as far as possible, by the Department but apart from previously established companies, several Government owned companies employ over 85,000 employees in the manufacture of small arms explosives,

ammunition, optical instruments, chemicals, bombs, and also filling shells and bombs.

In the government plants alone, the capital invested by the end of the year will amount to 76 millions.

Figures are dull, and Canadian figures not impressive in comparison with corresponding American or British totals, but take time to analyze the following totals, all from official government sources, on a per capita basis and they will show that Canada is in the job up to the hilt.

Contracts awarded and commitments made to mid-April (Department of Munitions and Supply only), \$1,525,000,000. Airport construction, under the Commonwealth Joint Air Training Plan, \$17,200,000. Number of contracts placed, of which an average of 8,844 per month were placed in the last quarter of 1940, 95,000. Commitments for new plants, \$383,000,000. New employees at work, 350,000.

Extent of Production

A few rough outlines will indicate the extent of the different products Canada has had both to learn and to equip to manufacture; until 1936 or later there was no attempt made to

produce them. The items following are among those which the government has thought fit to make public:

Shells—Eleven or more sizes from 40 millimetre to 9.2 inch in 39 plants, as well as all components such as fuzes, gages, primers, cartridges cases, and including all necessary explosives.

Small arms ammunition—For rifles and machine guns—"by the millions".

Rifles and Machine Guns—Rifle production is under way; Bren gun production is ten times the original estimate, and delivery requirements are being met fully; combined with two other types of automatic guns the output will shortly be at the rate of 97,500 per year with an additional plant now under construction to produce 50,000 per year.

Guns—Now in production are barrels for 3.7 anti aircraft and Bofors (40 mm. anti-aircraft) guns, with complete mountings for these two now almost in production, and realization certain within twelve months from the date of placing the order. Canada has made an offer to sell 4,200 of these barrels per year, and can deliver this number in addition to its own requirements.

The matter of manufacturing artillery in Canada was not originally con-

templated, so that orders were not placed until well on in 1940. Now many of the following guns are in production, and deliveries will be under way in all cases within the next six months: two types of anti-tank guns, three types of mortars, two field guns, and four naval guns, all with mountings, including a twin naval gun mounting. This work includes the forging of barrels, the complicated technique of machining the barrels, and the practices necessary to secure the great accuracy necessary in manufacturing the mountings have been handled with complete success.

Steel industry has expanded enormously and has produced with the greatest of success armor plate for tanks, carriers and armored cars as well as forging for gun barrels and shell billets.

Brass — Production has increased tenfold.

Automotive — The production of Universal Carriers, and other automotive equipments, including bodies, tires, etc. is well known and has been accomplished without waste. Over 100,000 units have been shipped and it has not been necessary for the United Kingdom to go to the United States for any of this equipment. Two types of tanks are now about ready to go into production.

Aircraft — With a very sketchy organization at the beginning of the war, this industry now employs 18,000 persons who are producing the following aircraft in Canada: Hurricane Fighters — the production of these machines was at one time announced as 15 per week, Stranraer Flying Boats, Hampden Heavy Bombers, Bolingbroke Medium Bombers, Lysander Army Cooperation Planes, Norsemen Radio Trainers, Harvard Advance Trainers, Fleet Primary Trainers, and Tiger Moth Primary Trainers.

Now in production with delivery promised for this summer are a twin

engine trainer, the Avro Anson, and the Fleet 60 advanced trainer.

Plans are also under way for the manufacture of three American types, the Fairchild M-62 Primary Trainer, the Consolidated Catalina Patrol Bomber, and the Martin B-26 Medium Bomber.

Shipbuilding — Canada has long had a shipbuilding industry, one which in 1914-18 showed its weight most successfully in furnishing steel and wood ships. In 1940 the chief war output was in small vessels, though about 50 millions worth of orders have been placed. Today the shipbuilding program involves an expenditure of more than 120 millions. Some 226 ships have been ordered, not including small craft, and by June 1 more than 120 had been delivered or launched.

The vessels ordered are as follows: 80 corvettes, 60 minesweepers, 3 auxiliary cruisers, 27 vessels converted to naval use, and now construction is under way on 20 cargo ships, mostly of 9,400 tons.

There are 17 major yards and 45 smaller ones engaged on this program and now employing 20,000 men.

Machine Tools — Canada, while having several excellent machine tool building plants, has always imported a large proportion of the machine tools used. While Canadian machine tool production has increased over 1500% due to war requirements, imports from the United States reached 24 millions in 1940. While no priority rating for Canadian delivery from United States plants is enforceable, of the thousands of machines represented by these figures, not more than twelve failed to be accorded the priority promise and only two of these were deferred without the consent of the Department of Munitions and Supply.

A government company was set up to control the purchase of machine tools for Canadian war production,

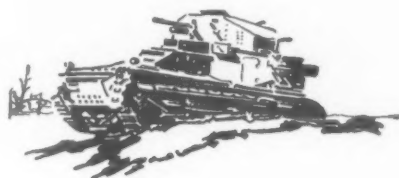
and has been very largely responsible for the smooth flow of both used and new tools so urgently needed, without an undue rise in prices.

Organization

The organization of Canadian industry to handle all this work in its great variety and complication and so frequently of a nature totally strange to the manufacturers who undertook it, represents what can only be described as a great achievement. Labor dilution has been carefully carried out, and the method of training employees for specialized production has undergone successive changes as the requirements were increased. Under the Dominion-Provincial youth training Plan, the existing curricula of the technical schools were used as far as feasible, but this was found too general in nature and required too much time.

The war Emergency Training Program was then adopted, and represents the closest cooperation between employers and instruction authorities. In each case, the students nominated by the manufacturers are given a short course, usually of about ten weeks, of subjects selected by the employer as representing most closely the conditions which would be required in industry.

The student is then placed in employment; given a job which has been already tooled up, and started under the tutelage of an experienced hand, who supervises his work closely until the new man is able to handle it alone. The upgrading system comes into play at this point, and a gratifying number of extraordinarily skilled operators have thus been uncovered. Here, of course, the fine hand of the Tool Engineer comes into its own, not only in the method of production, in the tooling and tool maintenance, but in the entire method of training employees and adapting the work to their respective abilities.



Canada Tools for Small Ordnance

The emphasis is on simple machines and simple operations as Canada tools for production of ordnance components.

By ARNOLD THOMPSON
Consultant for Defense Production

IN "Tooling Up" for the manufacture of Fuzes, Pistols, Primers, Small Shells, and similar National Defense Production, the experience of three wars may be of some guidance. I would first emphasize the desirability of simple machines and simple operations.

I admit that the expert Tool Engineer can design, the mechanic produce, the set up man maintain, and the operator run, full automatic ma-

chines with combination tools that will show a very interesting cost proposal. We know that such men are very scarce, and must therefore propose equipment that can be utilized by the help available.

In Canada we have accepted automatic proposals, and found in practice (particularly running automatics, 24 hours a day 7 days a week) that they will not maintain the accuracy of size, squareness, concentricity and

finish, that the armament inspection insists on.

First we slow down the machine. Then we rectify the rejects as these rejects increase. To save scrap we leave finishing allowance and add operations, till eventually the automatic machine is mostly a roughening out machine.

A cost study of the comparative merits of Automatics versus simple turret, multi-cut lathes, and drills is most essential, and usually in favor of simple operations, even without the added cost of rectifying the rejects. A \$3000 machine costs as much per day as the hire of a \$3.00 a day girl operator.

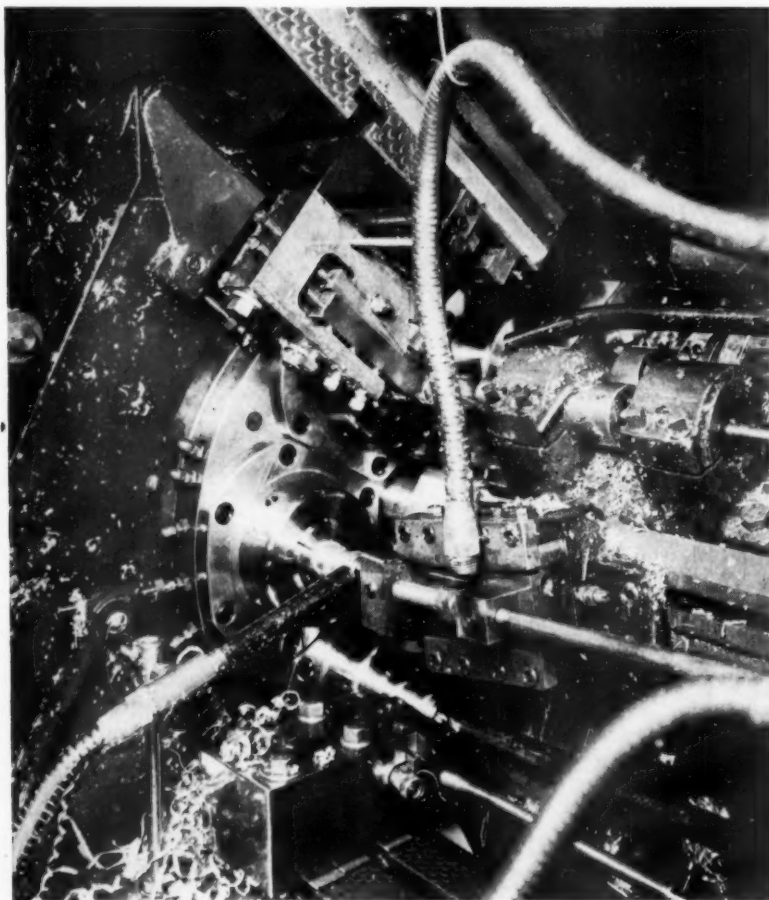
A number of improvements can usually be made to the original set up on automatics. To overcome some of the difficulties of maintaining accuracy, first divide form tools and shaving tools up into small blade units that will really cut with proper clearance and rake.

Time Study Synchronization

Another important factor is to Synchronize operations on a Time Study Basis; that is, if five seconds is the shortest operation and requires one machine to give the production then a ten second operation requires two machines and a 15 second operation requires three machines.

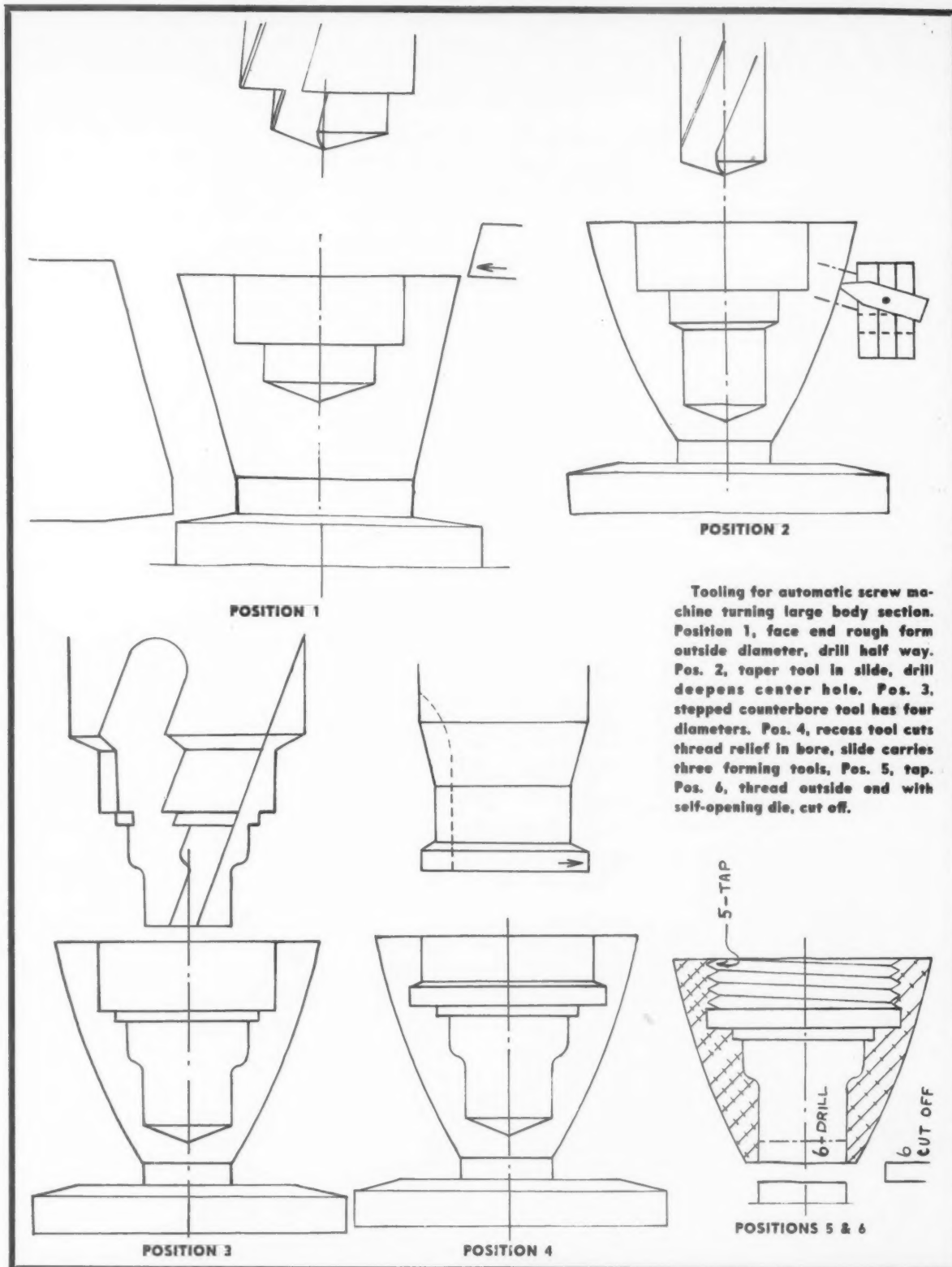
Arrange routing so that operations follow from hand to hand, save trucking, and avoid "Banks". Remember any cause for Down Time in one operation puts all the other operations on the same productive output and daily output is what counts when you compile your costs, and not one or two spectacular performances for a few hours and then trouble.

I would call attention to a small milling operation on a shutter .050 x .030 deep. Done with motor driven Ex-Cell-O spindle mounted on an



6-Spindle Automatic

Diagrams showing tooling of this machine for production of shell part are shown on opposite page.



Tooling for automatic screw machine turning large body section. Position 1, face end rough form outside diameter, drill half way. Pos. 2, taper tool in slide, drill deepens center hole. Pos. 3, stepped counterbore tool has four diameters. Pos. 4, recess tool cuts thread relief in bore, slide carries three forming tools. Pos. 5, tap. Pos. 6, thread outside end with self-opening die, cut off.

angle plate with hand operation of milling fixture. These same Ex-Cell-O spindles make ideal drill tools for small precision holes and many such simple ingenious devices will keep

machine troubles cost down to a minimum. All such simple devices can be made, set up and used by trainees with a short time experience. The actual cost of any article is the total

expenses incurred over the preliminary stages and production period, divided by the accepted production made in that period not the best cost, or piece work price plus estimated overhead.

Machine Tool Production in Canada

It has gone along quietly for years, and now is doing a magnificent job in producing the machines for Canada's Wartime Production.

By E. BARKER

President, Modern Tool Works, Ltd., Toronto, Canada

CANADA is not usually considered prominent as a machine tool producer. Her close proximity to the fabulous American production field, and the firm establishment of producers of every conceivable type of tool both in United States and England have made the way too easy to buy rather than make.

However, apart altogether from the changed conditions brought about by war, Canada has for over 80 years had a sound machine tool industry, producing staple lines of machines, such as lathes, planers, shapers, usually in a limited range of sizes, but proven capable of creditable accomplishment in special design of horizontal boring mills, very large planers, railway spec-

ialty lathes, and the most demanding of jig, fixture, and die casting work.

Among the twelve or more major firms and host of smaller ones, the names of Bertram, Canada Machinery, Williams, Ford-Smith, McDougall, Standard, Bowden, to mention a few, recall a long history of machine shop tools which have successfully produced much of the equipment which has contributed to Canada's splendid engineering reputation.

The war found the industry amply capable of producing special tools which the expanded market demanded. Gun lathes, single purpose shell lathes, milling machines, thread millers, bomb turret lathes have not only been added to the list of simpler

tools, but have been designed by Canadians to meet the needs; designed in incredibly short times and produced in great numbers to work not only in Canada but the Empire over, and if the history of the earlier half of the war is repeated, should soon be delivered in some measure also to the United States.

In the manufacture of the millions of shell that are now pouring from Canada, with the possible exception of minor items such as base plate riveters, all the shell-making machinery in Canada is Canadian in design and manufacture.

Two notable special machine tools for armament production entirely designed and built in Canada, are the

**Rotary Hydraulic Profile Milling Machine
Figure 1 (Below)**

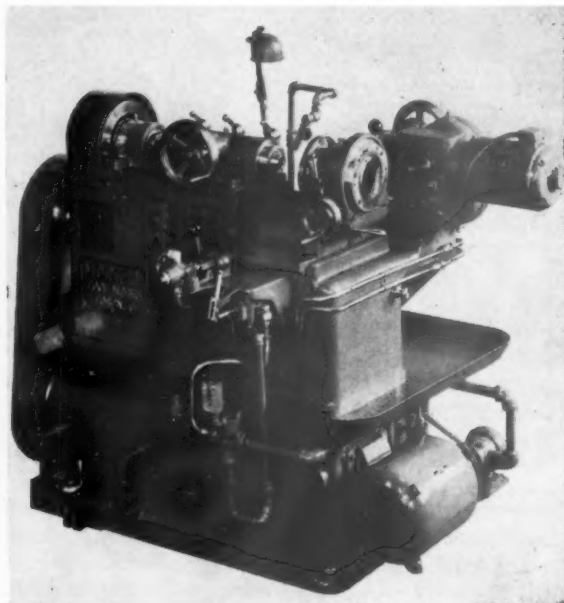


Figure 2 (Above)

Designed for internal profile milling operations.

THE TOOL ENGINEER

modern No. 1 and No. 2 size Rotary Hydraulic Profile Milling Machines, designed originally for profile milling operations on the Bren light machine gun components.

These machines utilize the principle of constant hydraulic pressure maintaining a master profile cam in contact with a follower roller, thus causing the work holding slide to reciprocate in and out with relation to the milling cutter which is fixed, and so generating on the work-piece a facsimile of the contour of the master cam.

Profile Miller

The No. 1 size machine having a geared head with pick-off gears to obtain various spindle speeds, is specifically designed for external contour milling operations. Single or gang cutters are mounted on a regular type milling machine arbor, supported by an outboard bearing. The work-piece is either chucked in locating fixtures which are built as an integral part of, and on the face of, the master contour cam, or work may be located on centers utilizing a tailstock fixture bolted to work-table. Such a setup is illustrated in Figure 1.

Figure 2 illustrates the No. 2 size machine which is specifically designed for internal profile milling operations, it has a quill type horizontal cutter spindle, and a much higher spindle speed range than the geared type machine. The machine uses entirely end mill type cutters which may, of course, be form type or plain as required by

the work-piece. Such gun parts as the internal elliptical profile of the trigger guard are especially adapted to this machine.

The work spindles on both machines are hollow and will accommodate a wide range of work passed through them for profile milling on the end of fairly long workpieces where required.

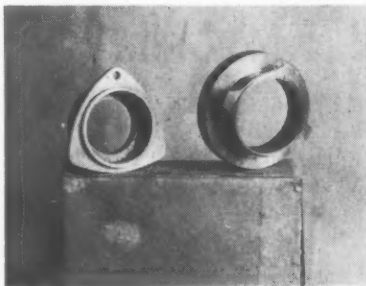


Figure 3
Aircraft engine parts.

A hydraulic metering device enabling the machine to take a plunge cut where the contour milling is to be continuous around the entire periphery of the workpiece is incorporated in the design. The purpose of this device is to permit the workhead slide to advance rapidly toward the cutters from the loading position to a point at which the cutters are approximately $\frac{1}{8}$ " away from workpiece and at this point check rapid infeed speed to a slow rate of advance so that the cutters will mill into the workpiece until the slide has reached the point where the master cam contacts the cam follower roller, at which point in-feed movement is checked automatic-

ally and rotary feed of workpiece commences.

Feed trip-out dogs are provided in an annular tee slot groove in the edge of the main feed worm gear. An ingenious arrangement of trip dogs at this point permits of rotary feed being set to traverse any number of degrees of a circle and trip out or where necessary, or mill completely around periphery of workpiece and finish blend out the cut past the starting position. The feed trips may be adjusted so that the work spindle will make a turn and a sixth or a turn and a quarter before tripping feed.

The speed of rotation of the workhead, which actually in a machine of this type constitutes a feed rate of workpiece, is variable within very wide limits (.04 r.p.m. to .64 r.p.m.) by means of pickoff gears located in feed gear box at right hand end of either type machine.

In addition to having found wide use in small arms plants, these machines have also found use in aircraft motor plants, a battery having been shipped from Canada to England and is at work in the Rolls Royce plant on Merline engine parts at the present time.

Figure 3 shows two typical aircraft engine parts, the contour cut of which is completely milled in one cut, production time per piece being three minutes. These examples serve to illustrate very graphically the typical class of work to which these machines are well adapted and are meeting with every success.

PLANS FOR A.S.T.E. TORONTO MEETING MADE

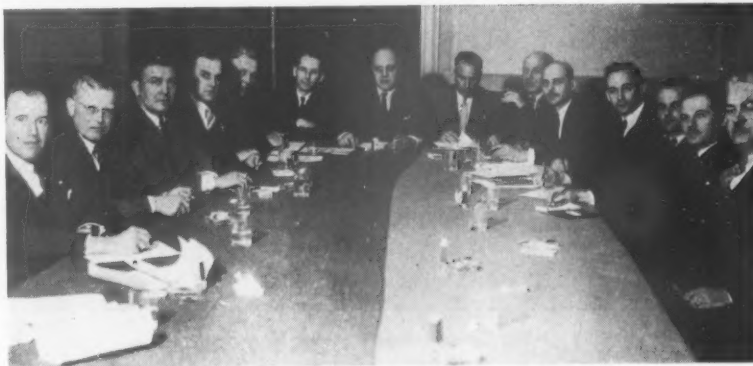
Plans for the semi-annual meeting of the American Society of Tool Engineers, to be held in Toronto October 16, 17, and 18, were drawn up at a recent meeting of the executive group held in Toronto.

It is estimated that the meeting will bring to Toronto more than 500 of the most active and prominent production tooling experts of the United States to study Canadian methods of wartime manufacture.

The committee is illustrated at its evening session and includes (left to right) William A. Dawson, Hamilton, chairman Hamilton Chapter; Charles A. Fisher, Dundas, 2nd vice president, Hamilton Chapter; Ray H. Morris, West Hartford, Conn., 2nd national vice president; Otto W. Winter, Tonawanda, N. Y., 1st national vice president; Ford R. Lamb, Detroit, executive

secretary; E. Greer, secretary Hamilton Chapter; Frank W. Curtis, Springfield, Mass., national president; Clyde L. Hause, Detroit, national secretary; Arnold Thompson, Toronto, convention committee chairman; Edgar Barker,

chairman, Toronto Chapter; Robt. W. Bruce, treasurer, Toronto Chapter; E. Norman Wearn, vice chairman, Toronto Chapter; Frank R. Crone, Detroit, national treasurer.



Wartime Sale of Machine Tools

Canadian expansion began much earlier than in the United States, and soon caused the creation of the new post of Machine Tools Controller.

By L. G. SINGER

Toronto Manager, Williams & Wilson Ltd.

WHEN the Tool Engineers come to Canada this Fall, they will be interested in the large number of new machine tools in evidence in the various plants which they visit.

After Dunkirk, it became apparent that Canada was going to have to far outdo anything that had been done here before, and for this reason, machine tools were ordered for Canada, somewhat ahead of the expansion of the United States, so that many of these tools have now been received and are in service, helping the general Cause.

It was during the first week of June, 1940 that machine tools were first ordered in substantial quantities, and in all sizes and types.

Realizing the delay in getting blueprints and other technical data, in many cases cable specifications of sizes and types of machines being used in England were received in Canada,

and equivalent machine tools ordered here, without regard to tooling.

The Government gave various plant managers authority to order their machine tool requirements ahead of receipt of all their drawings of the parts they were going to make, and the machines were later tooled by ordering what standard parts the manufacturers could supply, and making the balance here.

The Canadian Government appointed a Machine Tools Controller, whose job it was to facilitate the securing of machine tools for the plant, in time for their requirements, and he was given authority over all machine tools in Canada.

His first duty, was to size up what capacity Canadian plants had for building machine tools, and give them every assistance to bring them and the ultimate users together, so that sizes could be standardized as far as pos-

sible, and the work proceed with the minimum of delay.

At the same time, the Machine Tool Controller had control over the sale of used machine tools, and should some operation be held up for a particular machine or tool, the Controller will exert every effort to see that the production is smoothed out.

The second phase was the tooling and equipping of the various shops for making gauges, fixtures, and dies. Here, a survey was made of the plants, and as far as possible, they were assisted to get lathes, grinders, sawing and filing machines, and furnaces, which were their chief requirements.

Of notable interest has been the fact that machine tool deliveries have come through on the whole in very excellent shape, and almost 90% of the tools ordered have been shipped on the date promised, which is an enviable record for American machine tool manufacturers indeed, considering the handicaps under which they have been working.

However, through visits of their representatives and service men, they see the machines going immediately into production, which has no doubt been reported back at the factory, which helped to impress the urgency of the need.

The second outstanding fact, is the quality of the machine tools that have been shipped into Canada. One of the outstanding achievements, of the American machine tool industry, has been the increasing of its production, in many cases, doubling, or tripling the output of a particular plant, and at the same time, maintaining the same high quality with the larger volume of production. This has been a noteworthy achievement in the exercising of control over both materials and plants, because the complaints have been only a fraction of what they were in proportion formerly.



8-Spindle Conomatic Screw Machine
Canadian worker is testing diameter of 40 mm shell.

Helical Compression Springs

A simple solution to the ordinary spring problem and a spring data sheet that will save much needless design work.

By JOHN WESLEY LEE

*Chairman, Chapter Standards Committee
Dayton Chapter, American Society of Tool Engineers*

THE helical compression type is the most common of all springs and satisfies the majority of spring applications; its inherent characteristics makes it an indispensable element of construction in modern tools and machines.

Since the successful operation of every tool and machine depends upon the function of every elementary part it is obvious that a spring is just as important as any other part and should receive the same serious consideration.

Every tool and machine designer is frequently required to consider the use of a helical compression spring for some specific application. In a great many cases he does not give it the proper consideration, but simply passes the buck, by merely saying "spring to suit."

This unwise practice can lead to serious delays and costly changes, and should be avoided whenever possible. The designer should know the requirements, select the proper spring and provide ample space in his design for it.

Simple Solution

The object of this article, however, is to present a very simple solution of the ordinary spring problem, in such a manner that none of the essential phases of the problem will be overlooked, and one requiring the minimum amount of time and effort.

The time and effort required to make a suitable drawing of a helical compression spring, which should include at least three views, in order to have sufficient space to indicate the necessary dimensions, is much greater

than that required to select the proper spring.

After all, the only purpose of a drawing is to convey an idea of requirements, furnish the necessary data to the spring maker and provide a record for future reference.

A printed drawing or data sheet, showing the various views of a typical spring, with sufficient space for all necessary dimensions and data, from which blueprints can be made, will serve just as well as making a new drawing for each spring required.

It is obvious that the adoption of a standard data sheet for all helical compression springs will greatly reduce the time and labor required. A further advantage in using a standard data sheet is that it presents all the conditions of the problem that requires consideration, it also conveys all the data necessary for making and testing the spring.

The spring data sheet presented herewith shows a spring with the ends squared and ground and having nine and one half coils, in three different positions, Free; Initial; and Final. It also provides ample space for all necessary dimensions and data to clearly indicate all conditions in the three positions.

The height H ; the deflection F ; the pitch P ; the stress S ; and the deflection per coil f ; must necessarily be different for each different load imposed on the spring, therefore it is necessary to show all three positions in order to indicate all conditions.

A further examination of this spring shows that while there are nine and one half coils, there are only seven open spaces on each side. This indi-

cates that with this kind of ends, the number of coils must always end with one half, and that the number of active coils must always be two and one half less than the total number of coils.

There are several fundamental characteristics of helical compression springs that should be kept in mind. Up to the elastic limit of the material the rate remains constant down to the point where the coils start closing out, or in other words, if it requires ten pounds to compress a spring one half inch, another ten pounds will compress it another half inch, or the twenty pounds will compress it one inch.

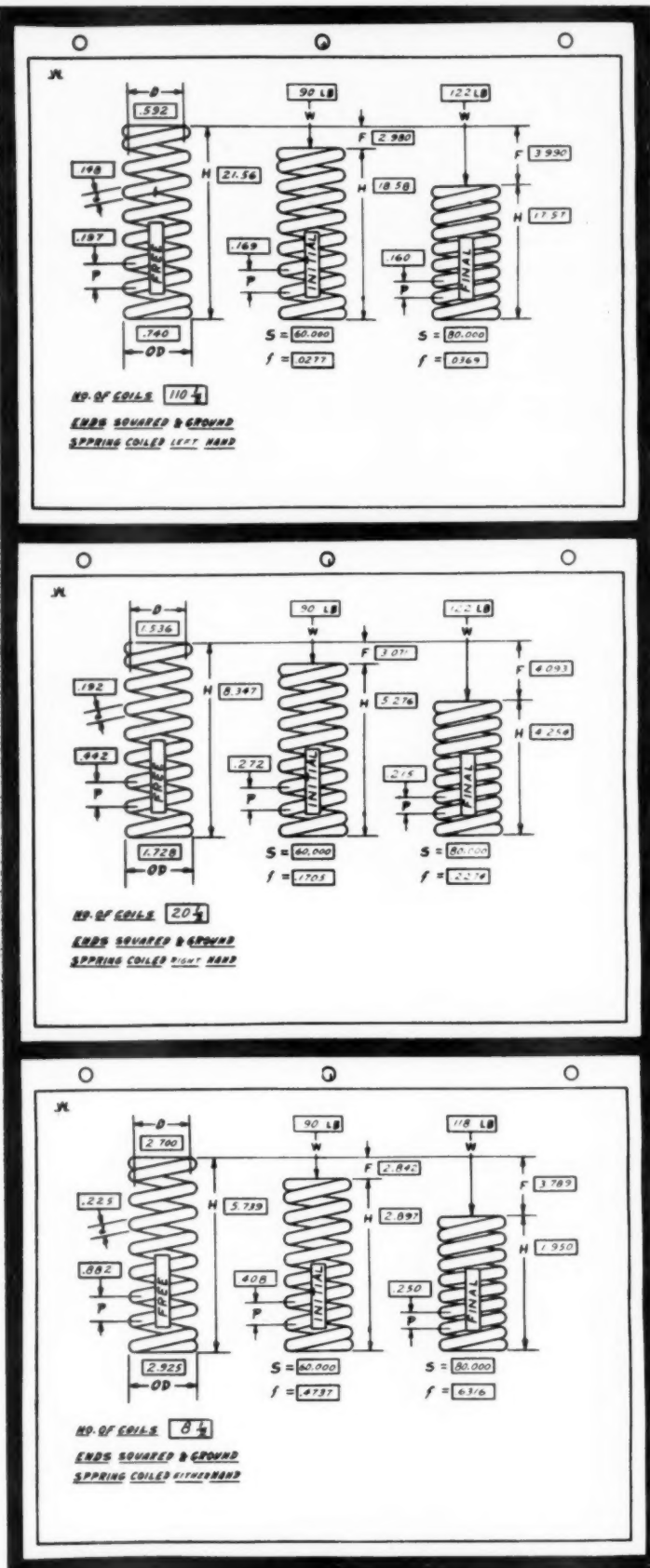
Carrying Capacity

The carrying capacity is directly proportional to the square of the wire diameter, which means that to increase the diameter of the wire by two, will increase the carrying capacity by four, provided the mean diameter remains the same.

The stress and deflection are both directly proportional to the load carried by the spring, therefore when the stress and deflection caused by a certain load are known, the stress and deflection caused by any other load can be found by simple proportion.

To select a spring for any specific application, at least some of the conditions must be known or assumed. Generally the first is the final load that the spring must carry; second is the amount of travel required; and third is the permissible difference between the initial and final loads.

(Continued on p. 50. On the intervening pages are the Spring Tables.)



HELICAL COMPRESSION SPRINGS

Illustrated at left are the standard spring data sheets referred to in this article. Each sheet is an identical form with blanks provided for filling in the necessary information on a particular spring. The three sheets shown are filled out with the data on the three examples used in the article.

SYMBOLS

W—weight carried by spring

d—diameter of wire

D—mean diameter of spring

OD—outside diameter of spring

P—pitch of coils

N—number of coils

H—height of spring

F—deflection of spring

f—deflection per coil

S—stress caused by the load W

G—torsional modulus

K—Wahl correction factor

R—ratio of D to d

FORMULAS

$$R = \frac{D}{d}$$

$$K = \frac{4R-1}{4R-4} + \frac{.615}{R}$$

$$W = \frac{.3927 S d^3}{K D}$$

$$f = \frac{.000 000 2729 S D^2}{K d}$$

$$H = P (N - 2\frac{1}{2}) + 2d$$

$$N = \frac{H - 2d}{P} + 2\frac{1}{2}$$

$$P = \frac{H - 2d}{N - 2\frac{1}{2}}$$

Helical Compression Spring Tables—I

		Stiff			Medium			Soft		
d	R	4	5	6	7	8	9	10	11	12
.020	W	2.805	2.398	2.094	1.854	1.664	1.504	1.378	1.264	1.169
	O D	.100	.120	.140	.160	.180	.200	.220	.240	.260
	f	.0062	.0104	.0157	.0221	.0296	.0381	.0479	.0585	.0702
.023	W	3.709	3.171	2.769	2.452	2.200	1.989	1.822	1.671	1.546
	O D	.115	.138	.161	.184	.207	.230	.253	.276	.299
	f	.0072	.0119	.0181	.0254	.0340	.0438	.0551	.0672	.0807
.025	W	4.383	3.747	3.272	2.897	2.599	2.351	2.153	1.974	1.826
	O D	.125	.150	.175	.200	.225	.250	.275	.300	.325
	f	.0078	.0130	.0196	.0276	.0370	.0476	.0598	.0731	.0877
.028	W	5.497	4.700	4.105	3.635	3.261	2.949	2.700	2.477	2.291
	O D	.140	.168	.192	.224	.252	.280	.308	.336	.364
	f	.0087	.0146	.0220	.0309	.0414	.0534	.0670	.0818	.0982
.032	W	7.180	6.139	5.362	4.747	4.259	3.851	3.531	3.235	2.992
	O D	.160	.192	.224	.256	.288	.320	.352	.384	.416
	f	.0101	.0167	.0252	.0354	.0474	.0610	.0766	.0935	.1123
.035	W	8.589	7.344	6.414	5.679	5.095	4.607	4.220	3.870	3.579
	O D	.175	.210	.245	.280	.315	.350	.385	.420	.455
	f	.0109	.0182	.0275	.0387	.0581	.0667	.0838	.1023	.1228
.041	W	11.79	10.08	8.802	7.793	6.991	6.322	5.791	5.310	4.912
	O D	.205	.246	.287	.328	.369	.410	.451	.492	.533
	f	.0128	.0214	.0322	.0453	.0607	.0781	.0981	.1198	.1439
.047	W	15.49	13.24	11.57	10.24	9.187	8.309	7.610	6.978	6.455
	O D	.235	.282	.329	.376	.423	.470	.517	.564	.611
	f	.0147	.0245	.0369	.0519	.0696	.0896	.1125	.1374	.1649
.054	W	20.45	17.48	15.27	13.52	12.13	10.97	10.04	9.212	8.520
	O D	.270	.324	.378	.432	.486	.540	.594	.648	.702
	f	.0168	.0281	.0424	.0597	.0799	.1029	.1293	.1578	.1895
.063	W	27.83	23.79	20.78	18.40	16.50	14.93	13.67	12.54	11.60
	O D	.315	.378	.441	.504	.567	.630	.693	.756	.819
	f	.0196	.0328	.0495	.0696	.0932	.1201	.1508	.1841	.2211
.072	W	36.35	31.08	27.14	24.03	21.56	19.50	17.86	16.38	15.15
	O D	.360	.432	.504	.576	.648	.720	.792	.864	.936
	f	.0225	.0375	.0566	.0796	.1066	.1372	.1724	.2105	.2526
.080	W	44.88	38.37	33.51	29.67	26.62	24.07	22.05	20.22	18.70
	O D	.400	.480	.560	.640	.720	.800	.880	.960	1.040
	f	.0249	.0417	.0629	.0884	.1184	.1524	.1915	.2338	.2807
.092	W	59.35	50.74	44.32	39.24	35.20	31.83	29.15	26.74	24.73
	O D	.460	.552	.644	.736	.828	.920	1.012	1.104	1.196
	f	.0287	.0479	.0723	.1017	.1362	.1754	.2202	.2689	.3228

Helical Compression Spring Tables—II

d	R	Stiff			Medium			Soft		
		4	5	6	7	8	9	10	11	12
.105	W	77.31	66.09	57.73	51.11	45.85	41.46	37.98	34.83	32.22
	O D	.525	.630	.735	.840	.945	1.050	1.155	1.260	1.365
	f	.0327	.0547	.0825	.1160	.1554	.2000	.2514	.3069	.3684
.120	W	100.9	86.33	75.40	66.76	59.89	54.16	49.61	45.50	42.08
	O D	.600	.720	.840	.960	1.080	1.200	1.320	1.440	1.560
	f	.0374	.0625	.0943	.1326	.1776	.2287	.2873	.3508	.4211
.135	W	127.8	109.3	95.43	84.49	75.80	68.54	62.78	57.57	53.25
	O D	.675	.810	.945	1.080	1.215	1.350	1.485	1.620	1.755
	f	.0421	.0703	.1061	.1492	.1998	.2573	.3232	.3946	.4737
.148	W	153.6	131.3	114.7	101.5	91.10	82.38	75.50	69.19	64.00
	O D	.740	.888	1.036	1.184	1.332	1.480	1.628	1.726	1.924
	f	.0462	.0771	.1163	.1635	.2190	.2821	.3543	.4326	.5193
.162	W	184.0	157.3	137.4	121.7	109.1	98.70	90.40	82.90	76.68
	O D	.810	.972	1.134	1.296	1.458	1.620	1.782	1.944	2.106
	f	.0505	.0844	.1273	.1790	.2397	.3088	.3878	.4735	.5685
.177	W	219.7	187.8	164.0	145.2	130.3	117.8	107.9	98.97	91.54
	O D	.885	1.062	1.239	1.416	1.593	1.770	1.947	2.124	2.301
	f	.0552	.0922	.1391	.1956	.2619	.3374	.4237	.5174	.6211
.192	W	258.5	221.0	193.0	170.9	153.3	138.6	127.0	116.4	107.7
	O D	.960	1.152	1.344	1.536	1.728	1.920	2.112	2.304	2.496
	f	.0599	.1000	.1509	.2122	.2842	.3660	.4596	.5612	.6737
.207	W	300.5	256.9	224.4	198.6	178.2	161.2	147.6	135.4	125.2
	O D	1.035	1.242	1.449	1.656	1.863	2.070	2.277	2.484	2.691
	f	.0646	.1078	.1627	.2287	.3064	.3945	.4956	.6051	.7264
.225	W	354.9	303.5	265.1	234.7	210.5	190.4	174.4	160.0	147.9
	O D	1.125	1.350	1.575	1.800	2.025	2.250	2.475	2.700	2.925
	f	.0702	.1172	.1768	.2486	.3330	.4288	.5386	.6577	.7895
.244	W	417.5	356.9	311.7	276.0	247.6	223.9	205.0	188.0	174.0
	O D	1.220	1.464	1.708	1.952	2.196	2.440	2.684	2.928	3.172
	f	.0761	.1271	.1918	.2696	.3611	.4651	.5841	.7132	.8562
.250	W	438.2	374.7	327.2	289.7	260.0	235.1	215.3	197.4	182.6
	O D	1.250	1.500	1.750	2.000	2.250	2.500	2.750	3.000	3.250
	f	.0779	.1302	.1965	.2762	.3700	.4765	.5985	.7307	.8773
.263	W	485.0	414.7	362.2	320.7	287.7	260.1	238.3	218.5	202.1
	O D	1.315	1.578	1.841	2.104	2.367	2.630	2.893	3.156	3.419
	f	.0820	.1370	.2067	.2906	.3892	.5013	.6296	.7687	.9229
.283	W	561.6	480.1	419.3	371.3	333.0	301.2	275.9	253.0	234.0
	O D	1.415	1.698	1.981	2.264	2.547	2.830	3.113	3.396	3.679
	f	.0883	.1474	.2224	.3127	.4183	.5394	.6775	.8272	.9930

Helical Compression Spring Tables—III

d	R	Stiff			Medium			Soft		
		4	5	6	7	8	9	10	11	12
.307	W O D f	660.8 1.535 .0957	565.0 1.842 .1599	493.5 2.149 .2413	436.9 2.456 .3392	392.0 2.763 .4544	354.5 3.070 .5851	324.7 3.377 .7350	277.7 3.684 .8974	275.0 3.991 1.077
.3125	W O D f	684.7 1.562 .0975	567.5 1.875 .1627	511.3 2.187 .2456	452.7 2.500 .3453	406.1 2.812 .4625	367.3 3.125 .5956	336.4 3.437 .7481	388.5 3.750 .9134	285.4 4.062 1.097
.331	W O D f	768.2 1.655 .1032	656.8 1.986 .1724	573.7 2.317 .2602	507.9 2.648 .3657	455.7 2.979 .4899	412.0 3.310 .6309	377.4 3.641 .7924	346.1 3.972 .9675	320.0 4.303 1.161
.362	W O D f	918.9 1.810 .1129	785.6 2.172 .1885	686.1 2.534 .2845	607.5 2.896 .4000	545.0 3.258 .5357	492.8 3.620 .6900	451.4 3.982 .8666	414.0 4.344 1.058	383.0 4.706 1.270
.375	W O D f	986.1 1.875 .1169	843.0 2.250 .1953	736.3 2.625 .2947	651.9 3.000 .4144	584.8 3.375 .5550	528.9 3.750 .7147	484.4 4.125 .8977	444.2 4.500 1.096	411.0 4.875 1.316
.394	W O D f	1089 1.970 .1229	931.4 2.364 .2052	813.5 2.758 .3097	720.2 3.152 .4354	646.1 3.546 .5831	584.3 3.940 .7509	535.2 4.334 .9432	490.8 4.728 1.152	454.0 5.122 1.383
.4375	W O D f	1342 2.187 .1365	1147 2.625 .2278	1002 3.062 .3439	887.4 3.500 .4834	796.0 3.937 .6475	719.8 4.375 .8339	659.4 4.812 1.047	604.6 5.250 1.279	559.3 5.687 1.535
.500	W O D f	1753 2.500 .1559	1499 3.000 .2604	1309 3.500 .3930	1159 4.000 .5525	1040 4.500 .7400	940.0 5.000 .9530	861.2 5.500 1.197	789.7 6.000 1.462	730.5 6.500 1.755
.5625	W O D f	2218 2.812 .1754	1897 3.375 .2929	1657 3.937 .4421	1467 4.500 .6216	1316 5.062 .8325	1190 5.625 1.072	1091 6.187 1.347	999.5 6.750 1.644	924.5 7.312 1.974
.625	W O D f	2739 3.125 .1949	2342 3.750 .3255	2045 4.375 .4912	1811 5.000 .6906	1625 5.625 .9250	1469 6.250 1.191	1346 6.875 1.496	1234 7.500 1.827	1141 8.125 2.193
.750	W O D f	3944 3.750 .2339	3372 4.500 .3906	2945 5.250 .5895	2608 6.000 .8287	2339 6.750 1.110	2115 7.500 1.430	1938 8.250 1.795	1777 9.000 2.192	1644 9.750 2.631
.875	W O D f	5368 4.375 .2729	4590 5.250 .4557	4009 6.125 .6877	3549 7.000 .9669	3184 7.875 1.295	2879 8.750 1.668	2638 9.625 2.095	2419 10.50 2.558	2237 11.37 3.070
1.00	W O D f	7012 5.000 .3119	5995 6.000 .5208	5236 7.000 .7860	4636 8.000 1.105	4159 9.000 1.480	3761 10.00 1.191	3445 11.00 2.394	3159 12.00 2.923	2922 13.00 3.509

A spring table showing the carrying capacity and the corresponding deflection per coil, for a variety of different sizes of springs made from each of the standard sizes of wire, affords an excellent guide for selecting the proper spring in terms of the desired carrying capacity.

Springs whose mean diameters are less than four times the diameter of the wire, are very seldom used because they are so stiff that they have practically no deflection, conversely, springs whose mean diameters are more than twelve times the diameter of the wire are very seldom used because they are so soft that they have practically no carrying capacity.

The spring table presented here-with gives the carrying capacities W ; the outside diameter $O.D.$; and the deflection per coil f ; for nine different diameters of springs made from each of the standard sizes of wire.

The formula used for calculating the carrying capacities given in this table includes the correction factor K , which was developed by Mr. A. M. Wahl of Westinghouse Electric & Mfg. Co. Pittsburgh and is published with his permission. The stress was taken as 100,000 pounds per square inch. The deflection per coil was calculated from the carrying capacities using a torsional modulus of elasticity of 11,500,000.

To clearly illustrate the use of the spring table and standard data sheet, let us assume for example that we want a spring that will carry a load of about ninety pounds at the initial position, one hundred twenty pounds at the final position, and have a one inch travel and that the maximum stress be about 80,000.

Since the table is based on a stress of 100,000 which is 25 percent greater than we want, we must select a spring from the table having a carrying capacity 25 percent greater than we want at the final position which will be 150 lbs.

Referring to the spring table, we find that a No. 4-.148 which is a very stiff spring, has a carrying capacity of 153 pounds; that a No. 8-.192 which is a medium spring, has a carrying capacity of 153 pounds and that a No. 12-.225, which is a very soft spring, has a carrying capacity of 148 pounds.

To clearly indicate the difference between these three springs we will proceed to calculate all the dimen-

sions of each using three standard data sheets to list the dimensions on. We will first list the diameter of the wire, the outside diameter OD , and the stress S of 80,000 at the final position.

Sample Calculations

Since the load W , the deflection per coil f , and the stress S are directly proportional, we must multiply the values of W and f in the table by .8 to obtain their corresponding values for 80,000 stress, which we list at the final position on the three standard data sheets respectively.

We want ninety pounds at the initial position, which is 75 percent of one hundred twenty for the final position at 80,000 stress, therefore the stress at the initial position must be 75 percent of 80,000 or 60,000.

Then to obtain the load W and the deflection per coil f at the initial position for a stress of 60,000 we must multiply the values in the table by .6, which we will list on the three data sheets respectively.

The next step is to determine the number of active coils in each spring, which is found by dividing the one inch travel by the difference between the deflection per coil at the initial and final positions.

For the No. 4-.148 spring the difference in deflection per coil is .0093 and one inch divided by .0093 equals 107.5 which we will increase to 108 active coils.

For the No. 8-.192 spring the difference in deflection per coil is .0568 and one inch divided by .0568 equals 17.6 which we will increase to 18 active coils.

For the No. 12-.225 spring the difference in deflection per coil is .1579 and one inch divided by .1579 equals 6.3 which we will decrease to 6 active coils.

Then adding $2\frac{1}{2}$ to the number of active coils to obtain the total number of coils, we get $110\frac{1}{2}$ for the stiff spring $20\frac{1}{2}$ for the medium spring and $8\frac{1}{2}$ for the soft spring.

The next step is to determine the pitch P of the coils at the three positions, the pitch at the final position must be a little greater than the diameter of the wire in order to have some clearance and make sure that none of the coils are closed, say .160" for the small diameter spring, .215" for the medium diameter spring and .250" for the large diameter spring.

Then to find the pitch of the coils at the initial position, add the difference between the deflection per coil at the initial and final positions, to the pitch at the final position, which gives .1693; .2718 and .4079 respectively for the three springs.

Then to find the pitch of the coils at the Free position, add the deflection per coil at the final position to the pitch of the coils at the final position which gives .1969; .4424 and .8816 respectively for the three springs.

Final Calculations

Then the final calculation is to determine the height of the springs at each of the three positions, which is found by multiplying the number of active coils by the pitch and adding two times the diameter of the wire.

For the stiff spring, 108 times .160 equals 17.280" plus .296 equals 17.576" final height; 108 times .1693 equals 18.284 plus .296 equals 18.580 initial height and 108 times .1969 equals 21.265 plus .296 equals 21.561 Free height.

For the medium spring, 18 times .215 equals 3.870 plus .384 equals 4.254 final height, 18 times .2718 equals 4.892 plus .384 equals 5.276 initial height and 18 times .4424 equals 7.963 plus .384 equals 8.347 Free height.

For the soft spring, 6 times .250 equals 1.500 plus .450 equals 1.95 final height, 6 times .4079 equals 2.447 plus .450 equals 2.897 initial height and 6 times .8816 equals 5.2896 plus .450 equals 5.739 Free height.

It will be noticed that the difference between the initial and final heights are not exactly one inch. This is because we changed the theoretical number of active coils to make them whole numbers.

The stiff spring and the soft spring represent the two extremes and are of course ridiculous examples for this application, they were included only to show the difference. But if the required stroke would have been only one quarter inch the stiff spring would be preferable and if the required stroke would have been three or four inches the soft spring would have been preferable.

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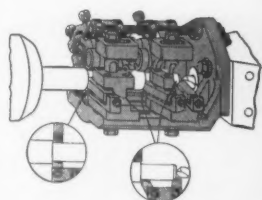
These new tools and services are Warner and Swasey's practical contributions to production demands which confront turret lathe users today. Perhaps we can help you! Write



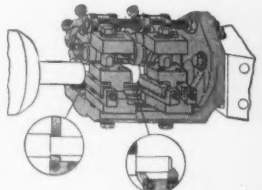
Send for the
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**WARNER
&
SWASEY**
Turret Lathes

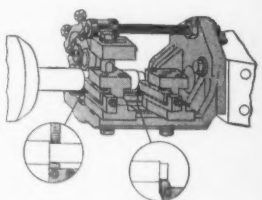
Turn Two Diameters, Chamfer and Start Drill—front rolls set behind first cutter burnish the large diameter—rear cutter block turns and chamfers and rear rolls assure accurate size—start drill is held in the turret.



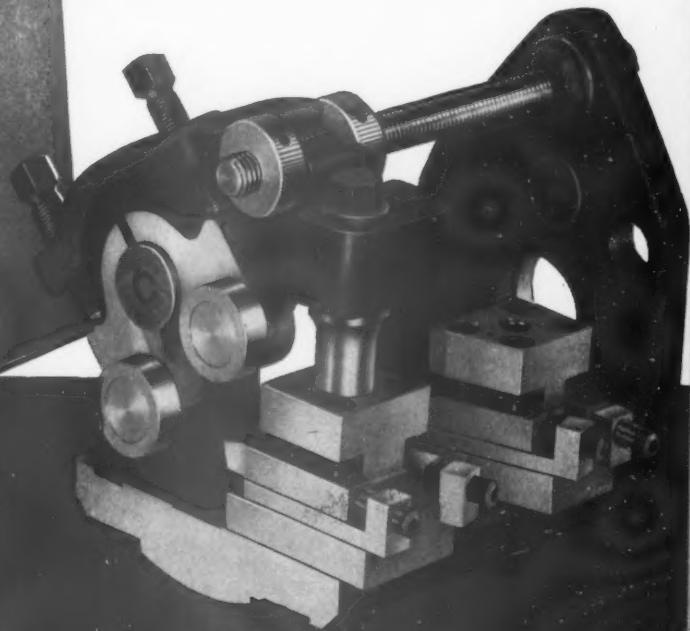
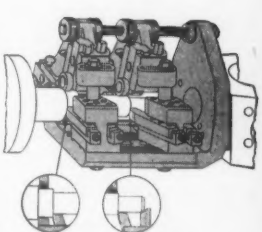
Turn Two Diameters and Chamfer—front rolls burnish the first diameter—rear rolls pilot on first diameter, permit heavy cuts and hold accurate size.



Turn Two Diameters at the Same Time—anti-friction rolls set behind the first cutter burnish the cut, producing a fine finish. Adjusting screws in the cutter blocks make cutter setting easy.



Turn Three Diameters and Chamfer—front cutter block is reversed because diameters are close together—rear cutter block holds turning and chamfering cutter—front rolls set behind first cutter to burnish—rear rolls pilot on second diameter.



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Small Tool Shortage Imminent

Now is the time to do something about it



By **FRANK W. CURTIS**

*President, American Society of
Tool Engineers*

TOOL Engineers throughout the country, responsible for National Defense production, have reported much concern lately regarding their inability to obtain a sufficient quantity of small tools to meet present requirements. Whether a serious condition exists or not may best be judged by the delay now experienced in getting deliveries of so many of the most important types of cutting tools, such as hobs, milling cutters, broaches, gear cutters, inserted-blade tools, just to name a few.

About six months ago, small tools of the so-called perishable type could be obtained in about four or five weeks. Today, deliveries have jumped to five or six months, and even more in some cases. Drills, reamers and taps, the most common of all tools, usually obtained from stock are also on the delay list. There just isn't any stock on hand these days. Immediate delivery is something of the past.

Is it possible that Washington has overlooked the importance of small tools in its desire to increase machine tool production? Small tools and machine tools go hand-in-hand. Both are indispensable in our defense program. One without the other is almost useless. A balanced output of both, therefore, is absolutely essential.

Steps have already been taken to overcome the shortage of gages and measuring devices that prevailed, largely through government financing, plant expansions and subcontracting. We all know that the machine tool industry now is operating in high gear, producing more

than 1000 machines daily. The next problem is to find out if our small tool output is sufficient to insure capacity production from all these new machine tools, as well as the hundreds of thousands of those already in use.

The average army rifle requires a tool expenditure of from \$3.00 to \$4.00 each, and according to very recent figures, a small tool investment of approximately \$300.00 is needed for the manufacture of each 2000 h.p. radial aircraft engine. Think of what this will mean in small tools alone for the proposed output of 500 four-motored bombers monthly!

We have eight plants now producing machine guns, with more to

follow. Our military aircraft output has been more than tripled. Tanks are beginning to roll out fast, with several new plants to start output this Fall. A naval ship of some form is being launched every 10 days. All in all, more than 800 new plants have been built since our defense program got under way last Summer. All this means a tremendous increase in the demand for small tools.

Users of small tools should, of course, recognize the delay that exists in getting tools and cutters, and should place their orders far enough in advance to avoid production handicaps. This is especially essential in connection with tools needed for all new machines on order. The big problem facing us, however, is to take immediate steps to prevent small tool shipments from falling farther and farther behind, whether it is a result of material shortage, plant capacity or equipment facilities.

Manufacturers of defense products have the right to ask what is being done to improve small tool deliveries. If deliveries continue to lag as they have in the past few months—with the possibility of getting worse—we shall find some difficult hurdles ahead of us. There is nothing more complex in shop operation than an attempt to meet output demands with a shortage of tools.

Any product so vital to our National Defense Program as small tools must be given serious attention. We have the opportunity to correct whatever errors might exist right now. We should not wait until an emergency exists.

"What is being done to improve small tool deliveries?"

"Is it possible that Washington has overlooked the importance of small tools in its desire to increase machine tool production?"

"Is our small tool production sufficient to insure capacity production from all these new machine tools?"



HELPING TO STEP UP PRODUCTION

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The above photograph shows a DeWalt Metal Cutting Machine cutting Dural formed stock for aircraft members.

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cut any three dimensions on simple or compound angular cuts, etc., by a simple adjustment of the controls. This DeWalt method is fast and accurate and eliminates distortion so common when cutting most light metals.

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DEWALT PRODUCTS CORPORATION
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Production Perspectives

News of Mass Manufacturing Everywhere

MACHINE tool shipments for May are estimated at \$60,800,000 as compared to \$60,300,000 for April and \$57,400,000 for March. Shipments for May a year ago were estimated at \$32,800,000.

Prediction that the nation's rapidly expanding shipbuilding facilities will turn out 1,250,000 deadweight tons of merchant ships this year, with an increase of 3,500,000 tons in 1942 and 5,000,000 tons in 1943 came June 14 from the Maritime Commission in Washington. In its first comprehensive summary of a vast three-way construction program, the commission placed the cost of 705 merchantment "built, building or under contract" at \$1,625,000,000, with an additional investment of \$86,000,000 in new facilities.

The first test flight of a new bomber being built for Britain showed it to be "about as fast as most of the pursuit planes flying in Europe," the Glenn L. Martin Co., Baltimore, disclosed June 15. The plane was flown June 15 at the Martin Field with British representatives looking on. It is faster than the B-26, which the Martin Co. is building for the army, but it has less range and bomb capacity, Joseph T. Hartson, Martin executive vice president, told a group of returned war correspondents winding up a 3,500-mile, two weeks' tour of defense plants. They were shown the new bomber and a huge flying boat under construction for the navy, comparable to the army's B-19, the world's largest bomber.

The United States office of education announced June 15 at Washington a "no-vacation" policy for vocational trade and industrial schools training workers for defense jobs. Many of these schools, the office said, would "operate on a schedule of 24 hours a day."

Jesse H. Jones, federal loan administrator, said June 14 at Washington that he intended to provide nearly \$1,000,000,000 to build plants for the 500-bombers-a-month program, drawing on his new defense spending powers. President Roosevelt in the week ending June 14 signed a law expanding the powers of the Reconstruction Finance Corp. and the federal loan agency. Specifically, it also gave the RFC \$1,500,000,000 additional special borrowing powers for defense purposes, with virtually no strings attached. The RFC already had committed all of a similar \$1,500,000,000. About \$500,

000,000 of this went for defense factories, \$600,000,000 to buy strategic metals like tin and copper, \$200,000,000 for rubber stocks and about \$200,000,000 in other defense loans. Jones would not say specifically what use would be made of the new funds aside from the financing of the bomber program.

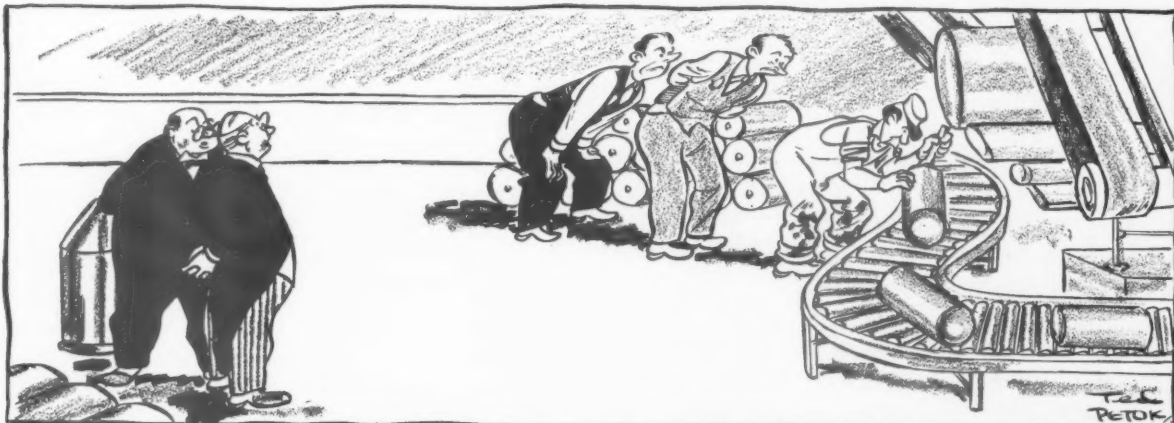
Labor Department statistics on June 15 showed increasing industrial wages were more than keeping pace with rising living costs. The Bureau of Labor Statistics at Washington reported living costs in mid-May were 2.4 per cent higher than in June of 1940. At the same time Secretary of Labor Perkins said weekly earnings in manufacturing industries in April averaged \$29.10 or an increase of 15.8 per cent since April, 1940. Wage increases were given more than 800,000 workers in the March-April period, Miss Perkins said, and average hourly earnings went up to 70.8 cents, a gain of 7 per cent over April, 1940.

WESTERN Massachusetts employers were warned to begin training women for industrial jobs as the only means of preventing a threatening collapse of defense production in this area. The advice came from James G. Walsh, district superintendent of the Massachusetts employment service, who disclosed that the supply of men available for training in defense jobs was nearly depleted.

The present labor supply and reservoir of potential defense trainees is "inadequate and low" Walsh declared. He advised that a program be started immediately to train women in factories and in trade schools to take the industrial jobs which are opening daily. After a survey of the labor market in western Massachusetts, conducted by the state employment service, Walsh said that within three weeks the situation will have become "so acute" that there will be "scarcely a man available for employment or training for defense work."

Voluntary pay raises and paid vacations in defense production plants in Massachusetts held the spotlight during June. A general 5 per cent wage increase has been granted 300 employees of the H. B. Smith Co., boiler manufacturers in Westfield. Wage increases of 5 to 15 cents an hour have

EFFICIENCY



"Him? Oh, he's the government inspector that inspects the government inspectors."

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—PRODUCTION PERSPECTIVES—

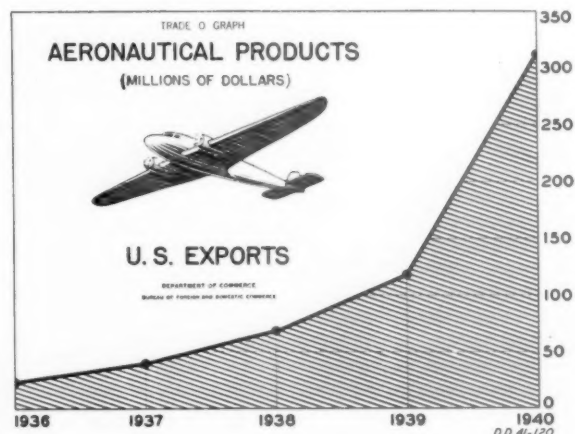
been granted by the American Bausch Co., Springfield to 3,000 employees. With 35 per cent of the employees of the Van Norman Machine Tool Co. on paid vacation June 29 to July 5, the other 65 percent stayed at their jobs and collected double pay. Van Norman is one of the busiest national defense plants in New England. A general 10 per cent wage increase for more than 1,300 employees of the Millers Falls Company was announced by President Philip Rogers. The increase affects office and factory workers in both Millers Falls and Greenfield plants. Rather than delay defense production now nearing its maximum, the Greenfield Tap and Die Corporation of Greenfield, will give its employees cash bonuses instead of vacations this summer, it was announced by Howard M. Hubbard, president and general manager. Harry K. Clark, general manager and vice president of Norton Co. says fifty per cent of the company employees have notified the management of their desire to forego vacations and stay at work producing defense materials. The company has posted a notice that those who pass up vacations would be paid extra.

AMERICA'S great defense drive was a year old May 24, with William S. Knudsen, the director of production, asserting that airplane deliveries had increased 400 per cent in that period, 1,625 new industrial projects had been started and \$15,200,000,000 worth of orders placed. The statistical picture of one year of American defense effort is: 1,625 new industrial establishments costing \$2,840,000,000 started and \$15,200,000,000 worth of orders placed. Army expanded from 264,128 to 1,400,000 men, and the navy and marine corps from 178,694 to 242,000. Airplane deliveries increased about 400 per cent. (A year ago there were 5,200 warplanes in service. Officials will not disclose the total today, but April deliveries alone amounted to 1,376 military planes.)

The Navy has contracted for 629 ships. Officials assert some deliveries are about a year ahead of schedule. Knudsen said of the defense program that every effort had been made to "spread the load over the United States and particularly every state in the Union has shared in the facilities, contracts or subcontracts." "We need the help of every manufacturer, engineer and production worker to get this industrial machine speeded up to its highest efficiency. We ask the support of this defense program from every citizen of the United States."

Military aircraft makers produced 1,334 airplanes in May compared with 1,389 in April.

Douglas Aircraft Co.'s \$11,000,000 "blackout" building now near completion at Long Beach, Cal., will be served by 35 air-condition systems, the Westinghouse Electric & Manufacturing Co. reports.



THE TOOL ENGINEER

WHAT IS THE TRUE MEASURE OF TOOL PERFORMANCE?

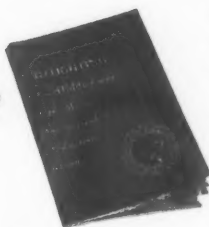


Is it the *life* of the tool in pieces? Or is it the total output of the machine or press over a period of time?

It is not how many pieces a tool will make that counts—but how *quickly* it will make them. Almost anyone could make a blanking die so heavy that with frequent pauses for regrinding it, it could produce a million pieces. The trick is to make a million-piece die requiring *no* regrinds—or only one or two. The real secret of high production is *uninterrupted* production.

That calls for top quality in tools, perfect design, expert tool making, correctly selected tool steels, exact heat treating procedures. Right there is where Carpenter can give you help, with a program for simplifying and improving tool steel selection and heat treatment. More than 1,000 plants are using this program to get *better* tools and reduce interruptions to production. Savings as great as 60 hours per month for a single machine have been obtained.

If you can afford 14 minutes to learn more about this program, write on your company letterhead for a free copy of our booklet, "Spot-lighting Hidden Plant Capacity." For those responsible for getting more out of present equipment—this booklet is an eye-opener.



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**MATCHED
TOOL STEELS**

A detailed discussion of the manufacturing operations upon the crankshaft for the Wright Cyclone Engine—the difficulties of precision production.

The 2600-A Crankshaft

By HOWARD B. COOK
Assistant Supervisor of Training
Wright Aeronautical Corporation
Paterson, N. J.

A COMPLETE story of the crankshaft for the 2600-14 cylinder double row engine would fill a book. More than 500 operations are required to manufacture the parts that go to make this shaft, so it has been necessary to eliminate much of the information that would be interesting. I had hoped to include the time required for operations, speeds, feeds, names of machine tools, cutting lubricants, description of fixtures, dimensions, and tolerances. This is out of the question for so many operations and so the discussion will be less detailed. After all there is some difference of opinion within our own organization regarding the relative merits of various types of equipment and besides machine tools are somewhat like what the fellow said about whiskey: when someone complained that the whiskey was bad, he said that there was no such thing as bad whiskey; it was only that some was better than others.

The figure 2600 indicates the displacement, and is equivalent to about 180 cubic inches per cylinder. Each cylinder is equivalent to an average automobile engine. There are seven cylinders in each row spaced around each crank-pin like the spokes of a wheel. The master rod fits around the crank-pin and the articulated or baby rods, are fulcrumed on pins, in holes in the master rod and operate in the various cylinders.

The rating of this engine is 1600 hp at 2400 rpm and the crankshaft weighs about 160 pounds, or one tenth of a pound per horsepower. The average automobile engine crankshaft weighs about one pound per horsepower.

The crankshaft is composed of three main parts. This construction makes possible the use of a master rod having a solid end. The rod is slipped onto the end of the crank-pin and then the parts of the crankshaft are assembled. The time required to manufacture this crankshaft has been reduced 21 per cent in the past year and most of this reduction is the result of the efforts of the Tool Engineers.

Despite this we still have a long way to go in the manufacture of aircraft engines before the industry attains the goal set by Mr. Stout. He said that for private planes we need an engine that has an output of 100 hp, that weighs 100 pounds, and costs \$100. He has been told that he will get it in 100 years.

Center Section

The rough forging of the center section weighs 110 pounds. When completely machined it weighs 46 pounds. Fifteen parts are run together as a lot through a series of 98 operations to prepare the center for sub-assembly.

The first operation is to cut off the short end. This is a bit confusing since it is really the long end until it

is cut off. The short end is really the rear end and is shorter because the rear end does not transmit as much torque as the front, or long end. The rear end only transmits enough torque to run some auxiliaries. The terms "short end" and "long end" are used in the operations sheets.

The piece that is cut off is about six inches long and has a diameter of about $4\frac{1}{4}$ ". Formerly a power hack saw was used and about 15 minutes required for the operation. It is now performed by an abrasive cut off machine in one minute. One of the 15 pieces cut off is laid aside for use later on in making test pieces.

A double head lathe is next used to turn the center bearing. A form tool cutting the full width of the bearing is fed in on the front side hydraulically. A similar finishing tool is fed in at the rear side.

The crank-pin ends are now centered. An indexing fixture clamps the part around the center bearing and a radial drill is used. After centering, the long crank-pin is turned on a lathe. The tailstock center is advanced and the clamp tightened. The center is then retired and a dial indicator and a lead hammer are used to true the center. The tailstock center is lubricated and advanced. Two tools are advanced radially at the rear to turn this radius and mark the cut-off length. Two tools about $2\frac{1}{2}$ " apart are fed along on the front side

to turn the crank-pin diameter. The short crank-pin is then turned in the same manner.

The crank-pins are now ground on an external grinder. A two part clamp ring is clamped around the center bearing. This ring fits accurately in a fixture and the crank-pin fits a bushing at the rear of the fixture. The clamp ring is gripped in the fixture and a lead hammer and a dial indicator are used to true the crank-pin as it rotates. The skill of some of these operators is uncanny. One or two taps with the hammer while the part is rotating is usually sufficient to true the part and it seems that a half revolution is sufficient to indicate the degree of accuracy attained.

The drilled center is not used to support the crank-pin in these operations and is not used for any later operations. It is only used when the crank-pins are turned. The crank-pins are ground at this operation for the purpose of providing accurate surfaces and diameters for holding the part in subsequent operations.

The next operation is a turning operation on an $8\frac{1}{2}$ " radius. Two parts are held on opposite sides of a fixture in a lathe and are turned together. Two tools are used, one cutting on one part and the other on the other part. The turned parts are not directly in line but are offset about two inches. The clamps are applied

to the ground surfaces of the crank-pins. After one side is turned the parts are switched and the other side is turned.

A series of milling operations follow. The face and angular surfaces are milled on horizontal millers. The part is held on a rotary table with the axis vertical. A hinged clamp fits around the crankpin and locates the part. A cylindrical cutter is used to machine the face and conical cutters are used to mill the angular surfaces as the table slowly rotates. The ends are milled in a similar manner.

Carburization

All of these operations have been performed for the purpose of removing the rough surface of the forging to remove incipient cracks caused by the forging hammer and to prepare the part for carburizing. The cylindrical surfaces of the crank-pins and the center bearing are to be hardened and any nicks or scratches would cause a variation in the carburization at these points so we grind the center bearing and regrind the crank-pins just before sending the part to heat treat.

The parts are inspected before going to the heat treat department. We do not inspect after each operation. The first piece is inspected at each operation and some floor inspections are made depending upon conditions. Even though we employ more than a

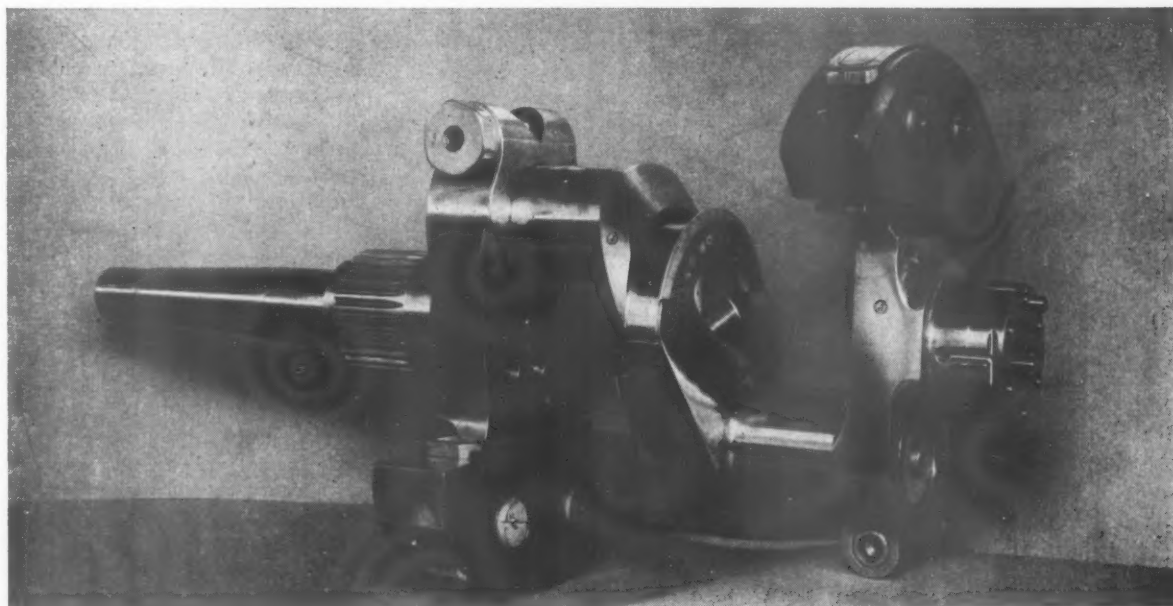
thousand inspectors in our plants we cannot inspect every part after each operation. After the parts are carburized and annealed, together with the test piece, the parts are inspected for hardness and distortion.

The center bearing is now ground for the second time. The center part of the crank-pins is bored out, the ends of the crank-pins are faced and the edge is chamfered. The spherical radii at the rear of the bores are turned.

The $8\frac{1}{2}$ " radius is finish turned on both sides. The face and the angular surfaces are finish milled. These operations remove the carburization so that when the part is hardened these surfaces are not hardened. The radius and angle at the ends are also milled. The oil carrying holes are drilled and reamed near the ends of the crank-pins.

Next a hole is drilled in the center bearing. The jig is indexed to the opposite side and a corresponding hole is drilled. These holes are later connected by a metal tube after taper reaming the holes from the outside. Two holes are drilled and taper reamed in each crank-pin, and short tubes are later expanded into them. They are used to lubricate the crankpin bearing.

Four holes are drilled and tapped on each face. They are enlarged at a later operation. Spotfaces are milled in and holes are drilled radially to the



The Crankshaft
Designed in three main sections, produced in more than 500 operations.

bored openings in the crankpins. Small holes are drilled at an angle in the sides of the crankpin ends. These holes are fitted with metering tubes to regulate the flow of oil to the sides of the connecting rods.

The center section is now inspected and is sent to the heat treat department to be hardened. The test piece that was previously sent along with the center section to be carburized and annealed has been turned on the outside to remove the carburized sur-

face and bored on the inside to $1\frac{3}{4}$ inches to form a hollow cylinder with a $\frac{7}{8}$ inch wall. It is sent along with 15 centers and goes through the hardening operation, but is not hardened because of the absence of any carburization. A tensile test specimen and an impact test specimen are cut out and tested. The results of these tests are recorded and if satisfactory, the lot of centers is released to be finished.

Remember, this center is machined, goes to heat treat where it is carbur-

ized and where some distortion is bound to occur. Then it comes back and is machined again, then goes to heat treat again to be hardened, which again causes some distortion, and is then returned for finishing. After the centers have been hardened, they are degreased, sand blasted, cleaned, and inspected, and are ready for finishing. Two plates called brackets are bolted to the sides of the cheeks and the center bearing is ground for the third time. The inner surfaces of the brackets are ground at the same time and this makes possible the accurate measurement and location of the center bearing. The crankpins are then finish ground.

Polishing Surfaces

The center hole is drilled, reamed, and ground. The purpose of this hole is to reduce weight. It is ground to reduce the work of polishing. The holes in ends of crankpins are finish bored and ground. The holes at the ends of the crankpins are ground to a tolerance of plus or minus .0005, because plugs are fitted accurately, as will be explained later.

Holes in the center bearing are ground to a depth of $\frac{1}{8}$ inch. These holes must be ground because the surface is hard. The remaining portions of these holes are drilled and reamed to clean up any roughness resulting from the heat treating operation. The points at which these small holes broke into the openings in the crankpins are drilled out to form small cups at the ends of these holes.

Holes are drilled in the bottoms of the holes in the crankpins to meet the holes previously drilled through the center bearing. All external surfaces except the bearings are ground and polished on a polishing jack. All internal surfaces are ground and polished; all holes are polished and radii are formed at all edges.

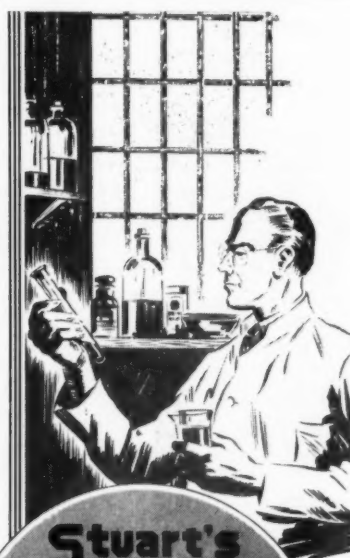
Grinding wheels and buffs driven through flexible shafts are used wherever possible but much hand polishing with abrasive cloth is necessary. Many gadgets have been devised for getting into the holes and recesses, but it is still a tedious job. There is a great need for a device which will get into these holes that meet at various angles and form uniformly smooth radii at the intersections.

The reason for all of this polishing

The FIRST CUTTING COMPOUND

*Developed Especially
for*

CARBIDE and other VERY HIGH SPEED CUTTING TOOLS



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SOLVOL
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Liquid Cutting Compound
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The Difference*

THE rapidly increasing use of carbide and other high speed tools emphasizes the immediate importance of this original type of cutting fluid. STUART'S SOLVOL Liquid Cutting Compound was developed especially for this exact condition. Where operations run "too hot" for properly applied straight cutting oils — and where ordinary soluble cutting oils or soluble paste compounds fail to produce satisfactory finish or tool life — that's the place for this original **Stuart Oil** development.

WIRE TODAY for working sample — FREE to any industrial concern working on defense orders. To assure proper application please tell us name of part, stock, machine and cutting operations.

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is to remove all scratches. When a part is highly stressed with fluctuating stresses, if there is the slightest scratch a fatigue crack will start at that point and the life of the part will be considerably shortened even though the stresses are below the elastic limit of the material.

The magnafluxing inspection is accomplished by magnetizing the part by passing a heavy direct current through it while it is submerged in an agitated bath of iron oxide and water. If there is any crack or even a scratch

chilled in dry ice and tapped lightly into place where they expand to a tight fit when they warm to normal temperature. They help to support the ends of the crankpins when the front and rear sections are clamped on. They can be removed without scratching the surfaces by heating the crankpins quickly with an electric heater.

Front Section

The rough forging for the front end weighs 114 pounds and the finished

larged by boring and reaming about 12½ inches deep and 9/16 inch hole is drilled to the center of the flange. Now we play a trick on it. In spite of our best efforts the hole probably ran out on us slightly so we slide the part down on a rigid vertical bar that fits the hole closely and recenter the flat end accurately with the hole and then we regrind the various diameters on the new centerline.

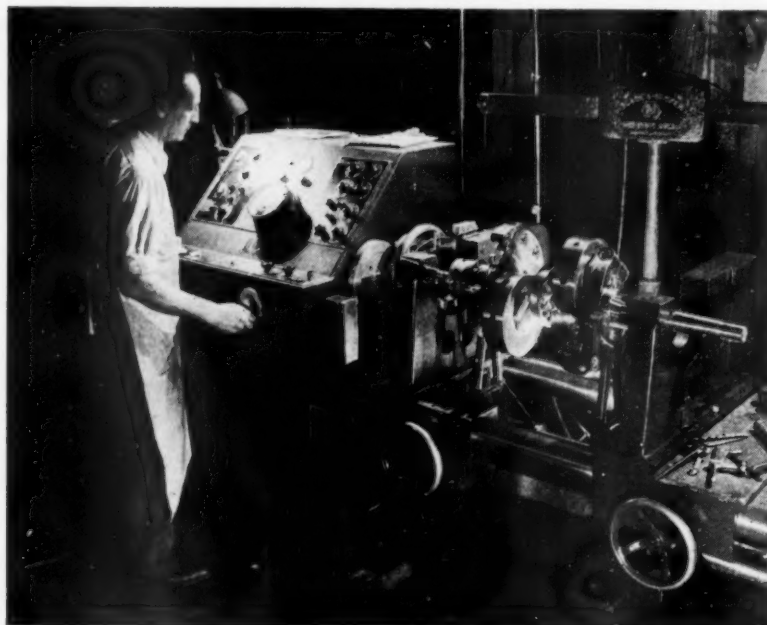
Next we mill the step on the flat cheek. Split bushings are slipped on the ground diameters and clamped in V blocks on the milling table. For this operation cutter axis and shaft axis are parallel. The milled surface is then ground for locating. The two counter weight holes are drilled.

The crankpin hole is drilled and bored and the undercut is formed. The step on the cheek on the shaft side is milled. The 8½ inch radius is milled. For this operation the shaft axis is vertical, end mill, rotary table. Mill the cheek edges, duplex miller. Mill central portion of cheek edge. The shaft axis is horizontal and weight arm axis is tipped so that the side is horizontal. The milling cutter has the right diameter to give the proper radius at the end of the cut. The cutter and shaft axis are parallel. The position of the shaft is reversed and the other side is milled. Now we form mill the cheek edges at crankpin end. Then mill excess stock at top. Profile mill around the crankpin on the flat side. This is one of those operations that requires the use of two arms and hands to keep the cutter spindle against a master form.

Now because we milled away the center on the flat side, this end must be recentered. The taper is turned on the shaft extension. We are using a cemented carbide tool very effectively for this operation. The average diameter is about 2½ inches and the speed is 350 rpm.

This completes the roughing operations and we begin to finish the part. We finish grind the main bearing diameter and the other diameters on the shaft extension while the shaft is held on centers. Next we drill, bore, ream, and tap the lock-pin hole. The crankpin face is then finish ground to bring it to the proper relation to the lock-pin hole.

The cheek face and radius around the crankpin hole are ground. This is done for a magnaflux inspection. Then the radius around the lock-pin



Dynamic Balancing Machine
An operation of great delicacy in less than a minute.

the magnetism will be concentrated at the edges and the particles of iron oxide will be held and will form a distinct black line that can easily be seen on the polished surface. The magnaflux test is one of the outstanding developments in the testing of steel parts and has contributed much to the success of the aircraft industry.

The center section is now ready for the sub-assembly. The central oil carrying tube is inserted and expanded. Short tubes are expanded into the holes in the crankpins. These short tubes select the oil from the center of the rotating pins and any particles of dirt or metal are thrown against the inner surface of the pins and can be removed when the engine is overhauled. The plugs that were previously mentioned are inserted in the ends of the crankpins. They are

part weighs 52 pounds. Fifty operations are required to prepare the part for assembly. The forging is centered on both ends when received. The first operation after inspection of the forging is to rough turn the various diameters on the front extension, while held on centers in an engine lathe.

A rough grinding operation on the same diameters follows, the largest diameter being held to a tolerance of plus or minus .0005 for locating in later operations. The flat side is then rough milled and the part is ready for drilling the deep hole. The drilling of this hole is a very particular and difficult operation. The drills and reamers are carefully selected and ground to drill the hole as true as possible. The first hole is drilled about 14½ inches deep and 1½ inches in diameter. Then this hole is gradually en-



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hole is milled. Form cutter and shaft axes are parallel and feed is vertical. The step on the extension side is finish milled and the 90 degree V is milled.

We now drill an oil hole through the crankpin hole to meet the long hole in the shaft. Then we drill an oil hole in the side of the shaft. The crankpin hole is finish ground. The fixture for this operation is square to within .0002 in eight inches and the throw accurate to the mean dimension.

The crankpin hole is then inspected for roundness, squareness, and throw. This is necessary because when the slot is cut distortion may result and the department might otherwise be accused of inaccurate machining.

A relief slot is milled in the crankpin hole for oil distribution. The end of the shaft is faced to the correct length and recentered. This recentering is for the purpose of removing any nicks or other damage that may have occurred.

The long bore is now finish ground, the reduced bore is finish ground, and the third section of the bore is finish ground. This final bore has a diameter of about $\frac{5}{8}$ inches and is difficult to grind accurately and effectively.

The thread end of the lockpin hole is countersunk and the spotface and angle are polished while under the drill press. This slot is now cut while tension is maintained to prevent pinching the cutter. The thread in the lockpin hole is lapped, all edges are rounded both outside and inside. Scratches and tool marks are polished out and after inspection the part is ready for assembly.

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Now assume that the engine is running at full speed. When an explosion occurs in a cylinder, the engine tends momentarily to speed up. The wiggle weight tends to lag back and in doing so absorbs some energy. As the propeller tends to slow down the engine before the next explosion occurs, the weight swings forward and tends to accelerate the engine. This continual speeding up and slowing down causes the weight to surge relatively back and forth alternately absorbing energy and giving up energy to hold the angular velocity constant.

It might seem that weights aggregating only a few pounds could not be very effective but a weight of one pound rotating around a center at a radius of eight inches and at a speed of 2400 rpm has a centrifugal force of about a thousand pounds. This device is so simple and yet so effective and so dependable that it is considered by many to be the outstanding development in aircraft engines.

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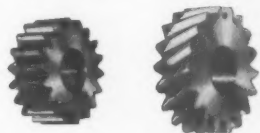
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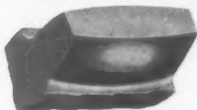


It removes compression strains by removing the strained surface metal in very fine hair-like chips under very little contact pressure. It is in no sense a burnishing operation.

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without it. One of the effects is to make possible the use of lighter propellers. It has been known that it is possible to drive a propeller with an electric motor indefinitely without failure but when driven by an engine without this vibration damper, the same propeller would fail.

I have been told that this invention was the result of an accident. They once had an engine that ran very smoothly and without vibration, and they couldn't account for it.

Finally when they took the engine apart, they found that the bolts that held the counter weight had become loosened. The natural movement caused the bolts and the holes to wear so that the counterweights had some movement and this caused the smooth running of the engine. This started an investigation that led to the development of the wiggle weight.

I didn't investigate this story because I was afraid that I might find it was not true. It would be a shame

to have such a good story destroyed by cold facts.

Rear Section

The operations on the rear section are so nearly like those on the front that a detailed description is unnecessary. The rough forging weighs 56 pounds and the finished part 26 pounds. Forty-five operations are required. We cut the same slot in the rear that we do in the front section. The sides of the weight arm were formerly made straight without the extensions at the sides and when the cut was made, the slot tended to widen slightly. Now since this end is enlarged the slot tends to close slightly. You may wonder why the addition of metal so remote from the slot would cause this reverse action. So do I.

The rectangular openings in the counterweights are broached. The center bearing supports are hardened and ground very accurately. They are made from a complete ring which is then cut. The thinness of this ring and accuracy required make this a difficult job. The counterweight bolts, pins, and bushings are case hardened on the bearing surfaces.

This brings us to a consideration of the machining and balancing assembly. The three main parts have been machined as accurately as possible, but the crankpin holes may not be exactly true with the main bearing supports. When a rigid shaft is supported on three roller bearings it is important that they be in accurate alignment.

The slot in the front end is spread and the long end of the center section is slipped into place. We do not hammer in a wedge to widen the slot, but use a screw device that works like a shaft puller. A space gage is used to space the parts accurately to provide the correct width for the master connecting rod. The assembled front and center are then placed in an engine lathe with the center bearing supported on a steady rest and the front extension held in the headstock. A dial indicator is then used to indicate the front main bearing and the front is tapped lightly until the bearing runs true. The bolt is then tightened until the bolt is stretched .009 inches. To measure the length of this bolt, we use two bearing balls fastened to a loop of steel, and we measure the

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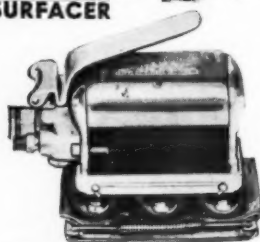
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length with a micrometer before and after stretching. This is more accurate than using a torque wrench. The rear end is then assembled to the short end of the center section in a similar manner.

The rear center is turned and the step at the rear main bearing is turned. The brackets are now assembled to the center bearing and after a spot has been ground on the front main bearing for a steady rest, the center bearing is trued up. This is the

fourth time that the center bearing has been ground.

The shaft is now run on centers with a steady rest at the center bearing while the diameters and radii at the front end are semi-finish ground. The assembly is reversed and the rear bearing diameters are ground.

The crankpin diameters are now ground. The cheek edges are ground on a surface grinder. For this operation the shaft is supported on V blocks at the front and rear bearing di-

ameters. The crankpins are accurately located in a parallel position and the clamps tightened. After this operation the shaft is placed on a magnetic table on a surface grinder, with the previously ground edges down, and the opposite edges are ground. We bore out the rear end for the internal spline that drives the rear shaft extension and then the crankshaft is disassembled. The center is magnafluxed because it has been found that in some cases incipient cracks have been revealed by the clamping and the finish grinding. The sides of the center bearing are ground on a surface grinder and the tapped holes, that held the brackets, are drilled to a larger diameter and tapped. The dowel pin holes are also drilled and reamed. This is the first time I have seen dowel pin holes drilled in a jig. It is necessary to renew reamer bushings frequently to maintain the degree of accuracy required.

Assembly Preparations

The oil distributing groove is ground between the oil holes in the crankpins and the oil distributing flats are ground. Two flats are also ground on the front shaft extension. The flat face of the front end is ground on a surface grinder using a rotary table and locating on the main bearing and a counterweight hole. The face of the rear end is ground in the same manner. The outside faces of the front and rear are also ground. The bronze space plates inside the wiggle weights lie against these surfaces and they must be accurate.

The front end is held in an engine lathe with the front bearing in a steady rest and the inner surface is centered. This is done for cutting the spline and grinding the thread. A chamfer is now milled on each edge of the counterweight supports. The counterweight pin holes are drilled close to full size, then ground. The bronze side plates are clamped in place and the holes are ground through to size. Matching numbers are stamped so that the plates will always be assembled to the proper part in the correct position.

The splines are hobbled on the front shaft extension. These splines drive the reduction gear which rotates the propeller at a lower speed than engine speed. A hole is drilled and

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reamed between the teeth of the splines for this pin and the splines are ground. The thread at the end of the splines is milled and ground.

The rear end slot is spread and after a dummy plug is inserted the bolt is tightened. The ID for the internal splines at the rear end is ground and the counterbore beyond is finish ground.

Six holes are drilled, reamed, and tapped around the rear end and one hole is drilled and reamed for a dowel

pin. Now the internal spline is finish cut. Oil grooves are milled across the shaft at the rear end on both sides of the shaft and connecting grooves are milled over to these oil holes. The dummy plug is removed. The edge beyond the crankpin hole is profile milled.

All radii are blended, corners are rounded, tool marks are removed. All surfaces are polished, both internal and external, excepting bearing surfaces. Parts are magnafluxed and de-

magnetized, washed, and inspected. The shaft is now assembled again.

Alignment holes are drilled and reamed. Holes are drilled and reamed through locking pins. All bearings are finish ground. This is the fifth grind for the center bearing. The assembly is inspected. Bearings must run true to .00025 inches. All bearing surfaces are ultra lapped to about two micro inches.

Dynamic Balance

The dynamic balance is next considered. I wish that it were possible for those engineers who have grappled with this elusive problem and who have achieved such wonderful success could receive the acclaim that their efforts so richly deserve. I do not even know who they are. I know that every producer and every user of machines that rotate at considerable speed, even to the small electric fan, owe them a debt of gratitude for adding to the smoothness, quietness and longer life of these machines.

The problem ranks with the gyroscope and its solution has required abilities which I cannot even enumerate and which are possessed by only a few individuals.

You will remember when we used to punch holes in a tin can lid and thread a loop of string through extended on both sides. We would then start the disc rotating and by alternately tightening and loosening the tension would cause the disc to rotate first in one direction and then in the other. At high speed the disc would rotate smoothly even though the string were not accurately centered. This was because the disc would rotate about its own center of gravity and because the string acted as a very light, flexible shaft.

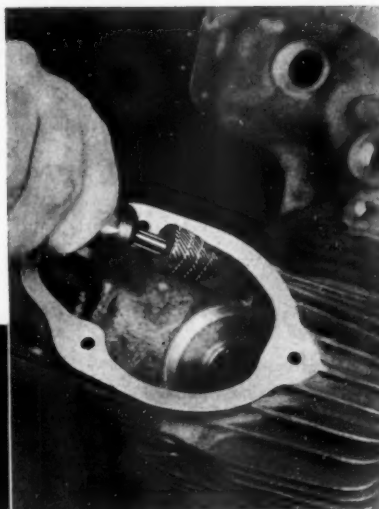
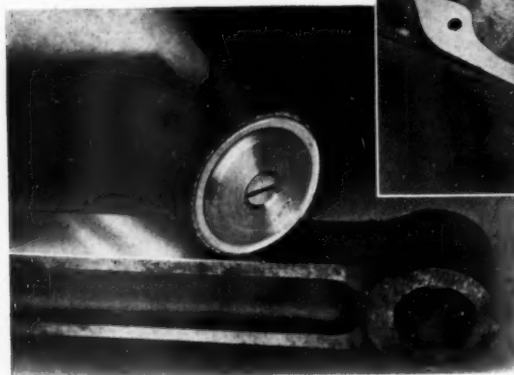
Assume a heavier disc mounted on a steel shaft supported on rigid bearings. If the center of gravity of the disc is slightly eccentric with the shaft, rotation will cause the shaft to bend slightly toward the center of gravity. The bending of the shaft continues with the increase in speed until the stiffness of the shaft becomes equal to the centrifugal force. This is the critical speed and the shaft suddenly becomes bent in the opposite direction and the disc rotates closely about its own center of gravity.

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Now assume that we have two discs of two weighted arms extending in opposite directions at different points on the shaft. This crankshaft is a good example. If this shaft were rotated at high speed without the master rods and baby rods the out of balance effect would be very pronounced even though it might be in static balance. In the balancing of this shaft, we clamp weights around each crankpin which are calculated to be equivalent to the master rod and baby rods.

The first machines developed for dynamic balancing were crude. They required static balance before the dynamic balance could be effected. They were built on spring supported platforms and rotating weights were manually moved until the bouncing of the platforms was stopped.

Today we simply place the shaft in the machine with the compensating weights clamped around the crankpins. Rotate the shaft at about 300 rpm, adjust a dial, and take a read-

ing. This gives the amount of unbalance at one end and the number of degrees this unbalance is away from the center of the weight. A switch is then moved and a reading obtained for the other end. The whole operation is accomplished in less than a minute. A previously developed set of tables show the size of drill and the depth required to remove the proper amount of metal from each end of each weight. The weights are placed in a jig and the holes are drilled at a definite position in the ends of the weights. After drilling, the weights are reassembled to the shaft and the balance is checked. The result will usually be accurate to within one eighth of an ounce at a radius of eight inches. This is a little more than the weight of a penny.

About three times this amount of unbalance would be required to move this shaft if supported on static balancing ways. Rotating the shaft at 300 rpm magnifies the unbalance about twenty times.

After balancing, the shaft is disassembled. The holes that were drilled in the counterweights are polished. All steel parts are magnafluxed and demagnetized. The entire assembly is reworked as per inspection instructions and when it finally receives the approval of the inspection department it is sent to finished stores.

That is the story of the manufacture of this crankshaft. An entire article could be devoted to some of the individual operations which have been merely mentioned, but something has been omitted which to my mind is more important than the crankshaft itself and that is the spirit which pervades these departments, where the men seem to get quite a kick out of seeing the crankshaft develop from the rough forgings to the finished product.

Machine Tool Buyers Warned to Beware of Profiteering

A warning to beware of offers to give quick delivery on their products for a premium price has been issued by the South Bend Lathe Works. All orders are filled in accordance with regulations of the OPM, and any such offers to the contrary by unauthorized persons should be reported to the company for investigation, the warning states.

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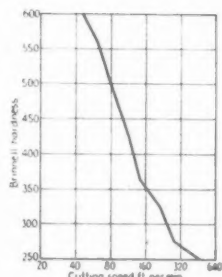


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Deliveries of standard KENNAMETAL tips are now being made within three to four days upon receipt of order; deliveries of standard and modified standard tools within ten days (except for unusually large orders). Write for Catalog 41 listing specifications and prices of standard tools and blanks.



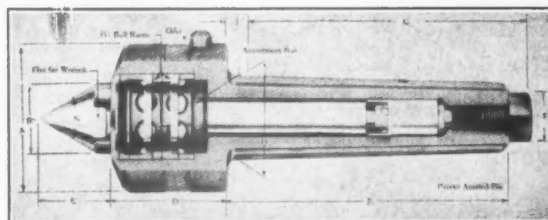
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LAWTON, MICHIGAN

Defense Places Further Burdens on

Machine Tool Industry

By A. N. WECKSLER

Washington, D. C.

WITH the machine tool industry producing at practically four times the volume of 1938, and with every indication that even this tremendous rate of production will have to be increased still further, several salient problems are now being considered—prominent among these is

the ultimate peak of production which may be demanded of the industry.

For while the annual production several years ago was \$200,000,000 worth of machine tools, and now stands at a level nearing the rate of \$800,000,000, it is generally conceded that if the United States is drawn into

full participation in the war, machine tool production will have to be jumped still higher.

Active participation in the war will mean that demand for planes, tanks, guns and all other types of munitions will increase, and that plants will operate at a more intense pace than at present. With this added demand, the operation of every machine tool producing unit in the country would be pushed to a three-shift basis, and the rate of production would be increased by another twenty percent.

Impossible Demands?

Ordinarily, such expansion would be considered impossible of accomplishment. However, the Tools Section of the Office of Production Management has adopted the slogan, "Nothing Is Impossible".

Possibly the best illustration of the part which the industry is playing in defense is contained in a statement made recently by OPM Director General William S. Knudsen. The Production head was asked whether the new bomber plane construction program would require the expansion of machine tool production. His answer was:

"Some, yes, because we have got four motors and we will need some tools, but it is pretty difficult. You see, we are going to expand the machine tool industry, make machine tools for expanding the machine tool industry. The rest of us don't get anything so we are doing it the other way, working longer hours, seven days a week. We are sub-contracting. We are doing something with the sub-contractors of machine tools. We picked up a lot of places where we can get it."

The question placed to Knudsen at this point was:



OEM, Photo by Palmer

Machine Shop at Brooklyn Navy Yard
Officials ponder expansion of machine tool industry to fill such needs.



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SERIES 24 BRYANT
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"In other words, you are not going to insist upon the machine tool industry expanding further?"

Knudsen's Viewpoint

Knudsen stated:

"I will let them come in and tell me. I am not going to run the business for them. They have done pretty well. I think they are entitled to a lot of credit, because they made \$200,000,000 worth of machine tools in 1938, they made \$400,000,000 last

year, and they swear up and down they will give us \$700,000,000 this year, and that is pretty nice."

To achieve the peak total of production for the year mentioned by Knudsen, the machine tool industry will have to produce at a much higher rate, as production during the first quarter of the year was lower than the \$700,000,000 rate.

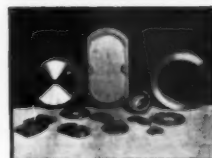
While it is difficult to forecast the peak which machine tool production will reach, the present rate is much

beyond anything that the world has ever known. It exceeds the combined capacity of Germany and the countries conquered by the Nazis.

The extent of the German conquests in relation to machine tool production can be seen when it is considered that the Skoda works in Czechoslovakia is comparable to Bethlehem. The Schneider works in France gave Germany a considerable source of tools, and French industry was tooled up for munitions production when the country fell to the invader. To Germany, it meant as much, from a machine tool and equipment viewpoint, as if she had marched into the State of Pennsylvania and



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"Fine finish, accurate flat surfaces" ... "High production even on small lots" ... "Operation is easy, quickly learned" —

these are the reasons for the esteem with which Blanchard Surface Grinders are held throughout the manufacturing industry. The Blanchard No. 18, at left, is typical of hundreds of installations where the full scope of Blanchard versatility is used. The parts shown include castings that are finished from the rough — rings with parallel faces — a circular knife ground concave (by means of the Blanchard concave grinding device). The No. 18 Blanchard is shown facing large rings at the rate of 96 per hour (former method produced 20 per hour). Perhaps Blanchard can offer you golden opportunities that you never realized. Just write —



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America's Knudsen

"I am not going to run their business for them."

had been able to commandeer the highly geared production industries in the State.

French production capacity was unimpaired, and the Nazis, following the age-old tenet that to the victor belong the spoils, stripped French industry. In addition to taking over the machine tool and munitions industries, the Germans diverted tools engaged in civilian production to war production.

The rate of machine tool production on the European continent is not known exactly, but industrial experts in this country believe that it does not approach the rate of our own current production.

A further element to be considered is the boast by United States produc-

THE TOOL ENGINEER

—MACHINE TOOLS—

ers that they still are maintaining their usual quality of production, even under the stress of defense needs.

In an analysis of how the extensive expansion of the machine tool industry was achieved, it is interesting that the greater part of the expansion was accomplished through organizing and adding to existing facilities. Construction of new plant facilities, while in the long run would have added to the production capacity, would have required a longer period of time, and at the same time, the process of construction would have tied up a large amount of machine tool capacity.

When the current crisis first made its demands on the industry, the so-called normal operations were at a forty-hour week per plant. When the first pinch in machine tools came, the industry added a few extra tools in the bottlenecks of production and worked a second shift. This expedient was responsible for the initial increases in production.

Other Increases

When further demands were made upon the industry, some plants adopted the third shift, and there was some plant expansion. Impetus to production was made through subcontracting, with plants formerly engaged in such operations as printing press and refrigerator production being worked into the machine tool production picture.

Any additional expansion required of the industry will have to be achieved through similar means, with greater adoption of three-shift operations and more extensive subcontracting.

The process of finding reliable plants to take sub-contracts is becoming simpler, as manufacturers throughout the country are finding that their normal operations are no longer feasible. With virtually all metals under priority control, and strict rationing of some of these metals in prospect due to shortage, it is increasingly difficult for manufacturers engaged in civilian production to get an even flow of materials to maintain their production schedules.

In consequence, these manufacturers, formerly unwilling to change over from civilian to defense production, are accepting defense sub-contracts. The high priority rating for machine tool

★ GUARDING
QUALITY
THAT
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War machines and munitions have to be good to stand up under war conditions. They must be made rapidly in huge quantities by a variety of plants. All parts must be strictly interchangeable.

Hence the task of guarding quality becomes a matter of life and death importance to a nation rearming to preserve its liberty.

Sheffield Visual Gages are stalwart guardians of dimensional quality. They are used in checking dimensions of manufactured and purchased parts, tools, production and master gages.

The sturdy Reed Mechanism, combined with the light beam lever arm, provides a sensitivity to meet the highest precision standards of measurement—but without the delicate fragility so often associated with sensitivity.

These gages are not delicate, they are strong and deadly accurate. They are made in various models to check accurately to thousandths, "tenths" or millionths of an inch and all provide rapid, easy gaging to any limits required on production work.

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builders insures a plentiful supply of materials.

The net result of this type of expansion is that the machine tool industry is not as vulnerable in case of war production stoppage as it would at first seem by the 400 percent increase in its operations. While the problem of what will develop after the war is not permitted to hamper our defense program, nevertheless it is being considered by both defense officials and the industry as a whole.

In the expanded machine tool picture, it is obvious that plants which are diverted from civilian goods production to defense production, will go back into their former field. Stocks of civilian goods will probably be depleted, and demand will be considerable.

Future Outlets

Plants on the European continent and in Great Britain will have to be retooled, and the general assignment

of rehabilitating Europe is expected to provide an outlet for United States machine tool capacity.

However, the greatest faith of the industry is placed with the manufacturing and inventive ingenuity of American industry. It is recalled that the era of the washing machine and mechanical refrigerator followed the last war, and new household devices, according to forecast, will be designed and provide consumers for tools.

The general attitude of the OPM Tool Section, made up with its quota of representatives of the machine tool industry, is that the production ingenuity which has increased machine tool production to its current high level is capable of finding an outlet for this production when the defense emergency is over.

In the meantime, the members of the Tool Section seem obsessed with restless energy. They come to work earlier and stay later than others in the Office of Production Management; their corridors seem busier; their offices more active.

The slogan "Nothing Is Impossible" is posted in each office, and there is a general feeling that the machine tool production problem is well in hand, and if further increases are made necessary through the grave developments of the war, the industry is ready to assume the responsibility.

A.S.T.E. Sponsors Course in Design

Sponsoring of a tuition-free tool design course at the Newark College of Engineering has been announced by Herbert D. Hall, Chairman, National Educational Committee, American Society of Tool Engineers.

The course is designed to help meet the shortage in tool designers in the New York-New Jersey area. Serving as advisory board, without compensation, for the course—which is underwritten by the United States Office of Education—are the following members of the A.S.T.E.: C. B. Carlson, Thos. A. Edison Company; H. B. Cook, Wright Aeronautical Corp.; W. T. Gray, Thos. A. Edison Co.; Mr. Hall; F. J. Oliver of the "Iron Age"; F. B. Shannon, Western Electric Co.; C. F. Sheeley, Hyatt Bearing Division; C. L. Thomson, Singer Mfg. Co., and J. L. Webster, Eclipse Aviation Division of Bendix Corporation.

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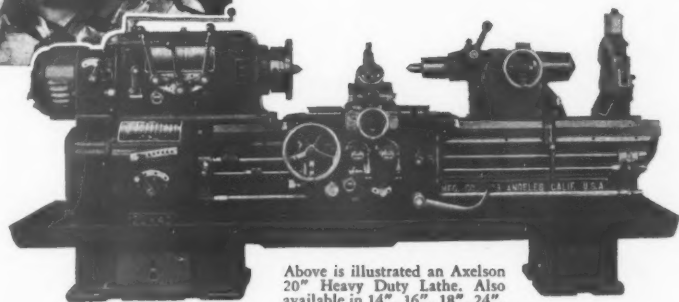
Some manufacturers of tool materials ambitiously claim "nearly diamond hardness". But why use second best, when the best is available? Nothing rivals Diamonds—the hardest substance known—for fast, accurate turning, boring, facing, truing, etc., on toughest metals, compositions and abrasive materials. Diamond tools turn out more work per machine at lower cost, last much longer, cut to closer tolerances, produce a superior finish.

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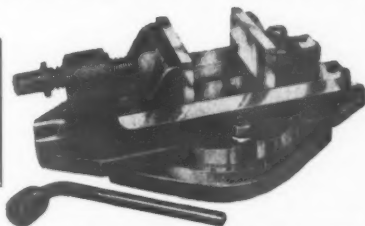
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Available for both heavy duty and general purpose milling and drilling

Work is supported and clamped on hardened surfaces. Bodies of semi-steel, reinforced with hardened and ground wearing surfaces, are practically indestructible. Jaws are adjustable in any desired position and provide extra large opening.

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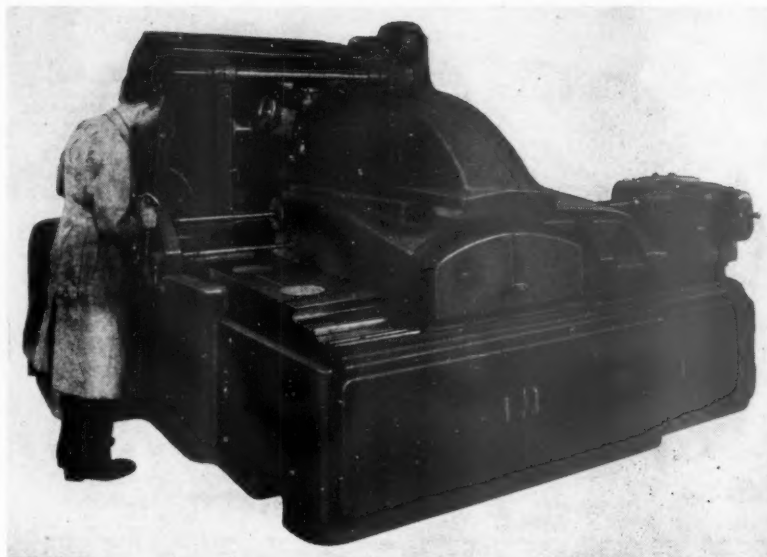
IT'S NEW

NEW EQUIPMENT—NEW MATERIALS—NEW PROCESSES

RED RING GEAR SHAVING MACHINE (E70)

→
A new horizontal 36,000 lb. Red Ring Gear Shaving Machine is announced by the National Broach & Machine Co., 5600 St. Jean, Detroit, Michigan. This machine is capable of handling gears up to 36 inches in diameter, two inch pitch and having face widths up to 36 inches, departs from general practice in that the cutting tool is driven by the work gear. This is done to eliminate high driving torque which might otherwise result if the cutter, as in smaller machines, drives the work gear, especially when the work gear is very heavy.

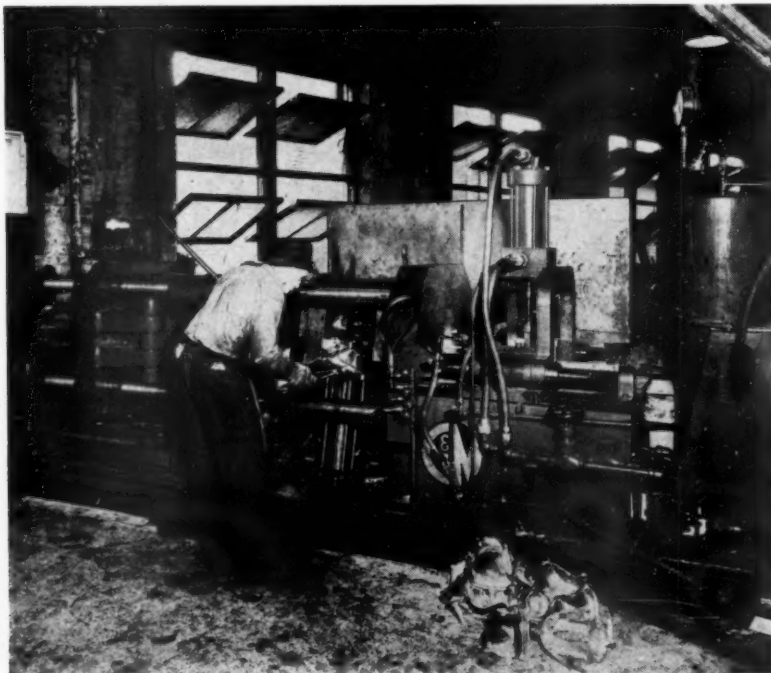
With the heavy work gear driving the cutter mounted in free ball bearing centers, the torque load between the cutter and the work gear is both constant and small. As in other Red Ring Gear Shaving Machines, the cutter head is built for crossed axes settings and is provided with a sine bar adjustment so that any setting can be readily duplicated. A feature is its ability to develop the ellipsoid tooth form so effective in eliminating gear failures and rapid gear



wear due to end bearing of gear teeth in operation.

The amount of crowning is optional and can be varied by a graduated adjustment in the slidable head. As the cutter is reciprocated across the face

of the work gear tooth, the work is automatically rocked, producing a deeper cut at the ends of the tooth than at the center. The cutter head slide is adjustable for various center distances up to 50 inches. The action of the machine is under control of microflex timing units and is entirely automatic. In setting up the machine, the automatic feed can readily be disengaged and the machine operated manually, when desired.

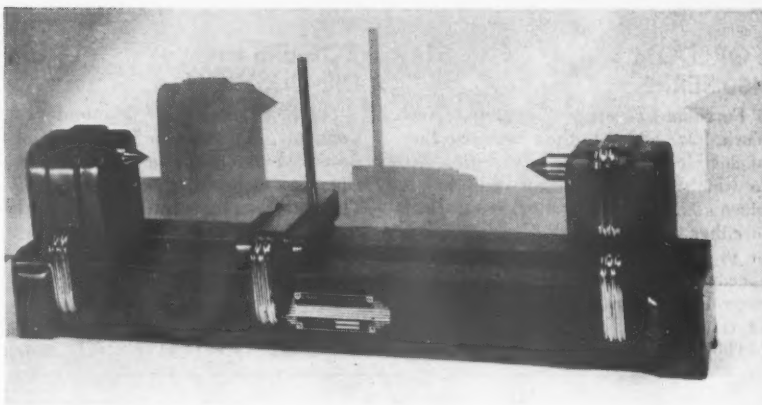


WELDED DIECASTING MACHINE (E71)

←
All welded diecasting machines sufficiently strong and rigid to make sound castings with little flash on high speed production schedules are now in successful production at the G. & N. Manufacturing Company, Cleveland, Ohio. These machines, designed for casting of zinc, tin, lead, aluminum, brass, and magnesium alloys, employ massive steel welded construction in the base, cylinder mounting, cylinder head, furnace, hydraulic fluid tank, shot cylinder, and goose-neck support. Only a few bolts and stud fastenings are used throughout the machine. Die plates of 6-inch thickness and 4-inch tie bars running through them preclude the possibility of breakage and assure a rigid machine.

The machine illustrated is a G. & N.

Diecasting Machine employed with three hydraulic core pullers which work cores in three different directions. These automatic core pullers permit extremely fast operation of the machine, it is said. When making small simple castings without cores or complex parts and using automatic ejection, the machine may be operated at a speed of 600 cycles per hour. Due to the extremely strong construction of this machine, it is claimed possible to operate at rates 20 to 30 percent faster than those usually practiced. Photo courtesy Hobart Bros. Co.



AMPCO BITS (E72) MACHINE PLASTICS

Reports received by Ampco Metal, Inc., Milwaukee, Wisconsin, indicate that Grade 20 Ampco Metal has proved satisfactory for tool bits for machining plastics. One builder of machine tools recently reported that in their experimental machine shop they took a thick walled cylinder of plastic about 2½ inches OD and 2 inches long, faced one end and turned it. The tool bit was in as good condition after the operation was completed as before. The resultant surface was excellent and a portion buffed showed a clean, smooth surface it was said.

BARBER-COLMAN (E73) BENCH CENTER

A new Bench Center for inspecting a wide variety of small work up to 6½" diameter by 18" long, is announced by Barber-Colman Company, 213 Loomis Street, Rockford, Illinois. This bench center is said to provide an accurate, fast method for inspecting cylindrical and circular pieces. It includes a quick-acting lever on the tail center which clamps the center or unclamps and retracts center all in one motion. All three sliding members locate from the

same reference surfaces, insuring accurate sliding indicator base with relative location of centers at any point along the bed.

The purpose and use of this center is for inspecting cylindrical and circular pieces which are either held between centers, or are mounted on arbors as in the case of a gear or gear blank. The work is inspected usually by being rotated by hand under a dial indicator which registers the amount of runout or eccentricity. In addition work may be checked axially to determine side runout or camming action on the sides of shoulders or collars.

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Pressure brought about by national emergency is an experience with which we have dealt before . . . Again today, all Eclipse manufacturing and engineering facilities are being drafted to help those producing national defense materials!

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FOREDOM 400 SERIES

(E74)

Foredom Electric Company, New York, have added to their complete line of flexible shaft tools a new Series 400 in which the flexible shaft and hand-piece assembly can be quickly attached to either the geared end for low speeds or to the motor shaft direct for high speeds. A six-step foot-operated speed control is included with the tool, which provides a speed range of from 500 to 14,000 rpm.

ROGERS DIE CUSHION

(E75)

The Dayton Rogers Manufacturing Company, Minneapolis, Minnesota, have produced a new design of Pneumatic Die Cushion known as Model CCC. These cushions are furnished in double tandem units, and are primarily designed for extremely heavy ring holding pressure on large double-throw, single-crank presses.

They are supplied with a combination regulating valve and pressure gauge

that controls and regulates all working draw ring holding pressures. The design of the cylinder section shields the working parts of the cushion cylinders so that no pierce slugs or loose parts can come in contact with the cushion



unit, according to the manufacturer. On these larger tandem cushions a pit is usually provided on the larger presses and the cushion equipment comes complete with a remote centralized lubricating block or header. This centralized lubricating block is furnished with leads to carry the lubricant to the desired location on the individual cushion cylinder.



"DBL High Speed Steel helps to conserve the nation's supply of tungsten, and to protect you against possible shortage, because it contains less than 1/3 as much tungsten as 18-4-1. And...DBL's performance actually equals or beats 18-4-1, and it costs less!"

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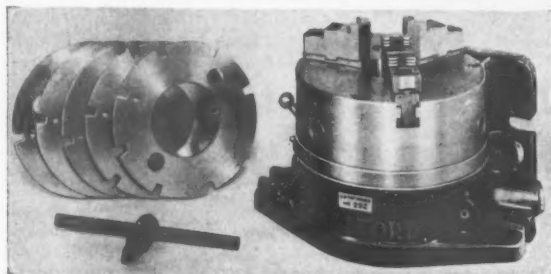
(E76)

The application of Vibro-Insulators, the devices of metal and rubber manufactured by The B. F. Goodrich Company, Akron, Ohio, are said to be assisting in the program of national defense by making machine tool operation more efficient through insulation against vibration. An outstanding example of this is reported to the company by the Cadillac Motor Car division of General Motors Corporation, where Allison airplane engines are being manufactured. Vibro-Insulators were installed on machines working on the Allison engines, in locations on the production lines where this would have been impossible without the vibration eliminators. Before installation of these devices, it is claimed, all machines having excessive vibration had to be installed on the first floor and away from all precision equipment, such as grinders, and precision boring machines. So effective has been the Vibro-Insulators that broaching machines have been moved to the third floor of the plant and located near finish grinders with no effect on finishes obtained in the grinders, it is said.

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Because it provides accurate indexing, even under heavy cuts, you can operate your milling and drilling machines, slotters and planers at faster

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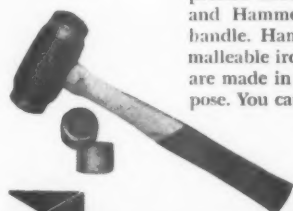
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Chicago Rawhide Mallets and Hammers are the best tools you can buy for protecting surfaces when they need to be pounded.

Genuine Java Water Buffalo Hide will not split, crack or break. The hydraulically compressed heads of Chicago Rawhide Mallets and Hammers are safe to use and safe to handle. Hammers have replaceable faces in malleable iron heads. These economical tools are made in sizes and weights for every purpose. You can get them through your dealer.

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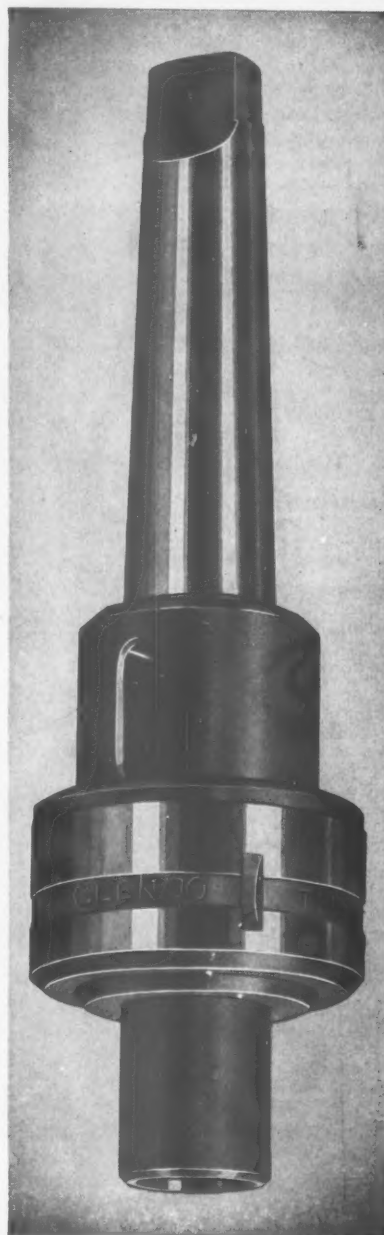
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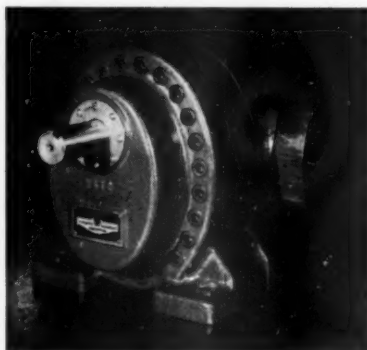
THE J. C. GLENZER CO.

DETROIT

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**HYDRO-POWER
GENERATOR****(E77)**

A new larger size gear type hydraulic pressure generator is announced by Hydro-Power Systems, Inc., Mount Gilead, Ohio. This model gear pump has a delivery of 60 gallons of oil per minute at 1000 pounds per square inch line pressure. The pump is a constant delivery type. It has unusual heavy duty construction with flange connections. It is said that close tolerances are maintained between working parts so that pump output efficiency is high.



Precision spur gears of narrow width and large pitch diameter are used. This design reduces both the hydraulic load of the gears and the distance between the gear shaft bearings so that shaft deflection is minimized. Also with this design, higher working pressure can efficiently be obtained.

These pumps serve as prime movers for hydraulically operated machines requiring medium pressures. Also used in conjunction with high pressure pumps to furnish large volumes of fluid at medium pressure to effect rapid traverse of the machine cycle.

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from SHEET STEEL up to 1/4"

**NON-FERROUS
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These superb machines, delivering over two miles of saw blade travel per minute without vibration, are doing hundreds of metal cutting jobs in a fraction of the time previously required, in metal working plants of every description throughout the country. To increase production and make important savings get the details NOW! A line requesting Metal Cutting Band Saw Bulletin will bring them to you promptly.

KIND OF MATERIAL	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
MILD STEEL	12-24	6	3	1	1/2	1/4	1/8
STAINLESS STEEL	6	2	1	1/2	1/4	1/8	1/16
YELLOW BRASS, ZINC	24	12	6	3	1 1/2	3/4	1/2
BRONZE OR COPPER	6	3	1 1/2	3/4	1/2	1/4	1/8
ALUMINUM	24-48	12	6	3	1 1/2	3/4	1/2
DURALUMINUM	24	12	6	3	1 1/2	3/4	1/2
SINGLE PLYMETAL	6	4	2	1	1/2	1/4	1/8
DOUBLE PLYMETAL	4	3	1	1/2	1/4	1/8	1/16
PLYWOOD	24-36	12	6	3	1 1/2	3/4	1/2
ASBESTOS BOARD	12	6	3	1 1/2	3/4	1/2	1/4
FIBER (HARD)	24	12	6	3	1 1/2	3/4	1/2
PAPER BOARD	24	12	6	3	1 1/2	3/4	1/2
MASONITE	24	12	6	3	1 1/2	3/4	1/2
BANELITE	12	6	3	1 1/2	3/4	1/2	1/4



PERFECTLY SAFE: Two-wheel Lockheed Hydraulic Brakes automatically and instantly stop the wheels in case of saw blade breakage—completely guarded.

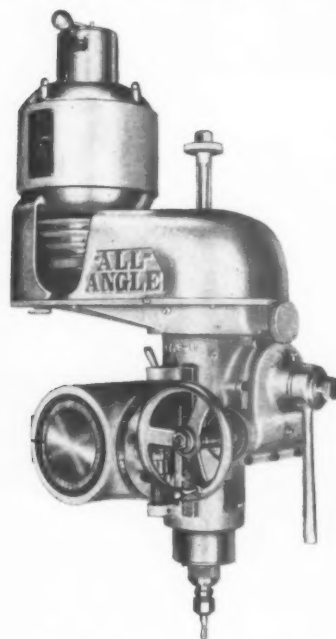
Incorporated in Tannewitz High Speed Band Saws are many highly developed, patented features found in no other band saws.

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

FRAY**(E78)****MILLING ATTACHMENT**

A full universal milling attachment is announced by the Fray Machine Tool Co., 515 W. Windsor Road, Glendale, California. The housing is meehanite. Two squaring faces machined on housing for convenience in setting attachment square with table. Castings normalized and bore finished by grinding. Graduations on housing by sixteenths



for use with depth stop. The spindle is a chrome moly steel S.A.E. 4140. 6 splined, hardened and ground all over. Drilled for draw-in bolt. Collets can be either tightened by hand or with wrench. Spindle travel is 3 1/2 inches. Quill is hardened and ground all over. Compensated for extreme sensitivity. Means have been provided so that attachment can be instantly changed from micrometer wheel feed to hand lever feed.

Power Screwdrivers Cut Assembly Costs Motorized Hopper Units

A REVELATION IN HOPPER FEEDING

Three Models

ADAPTABLE TO PRESSES, THREAD
ROLLING MACHINES, CENTERLESS
GRINDERS AND SPECIAL
MACHINES

Drive Screws from
No. 2 to $\frac{3}{8}$ " Dia.

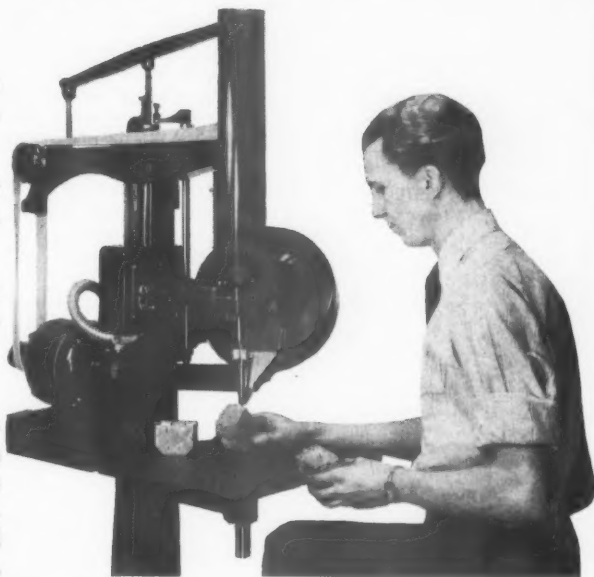
Driving Time
1 Sec. Per Screw.

Send Samples for
Production Estimates.

Write for Additional Information
on Magazine
Power Screwdrivers
and Motorized
Hopper Units.



HOPPERS FEED RIVETS, SCREWS, SCREW
BLANKS, NUTS, PLAIN WASHERS, AND
SPECIAL PARTS



DETROIT POWER SCREWDRIVER CO.
5373 ROHNS AVE. DETROIT, MICH.

Columbia TOOL STEEL

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In the Chicago district,
T. G. Dougall, District Sales
Manager, with staff at 326
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GENERAL OFFICE AND WORKS

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MORE SPEED LONGER LIFE with PUTNAM END MILLS



In an operation such as that illustrated
—milling $\frac{3}{8}$ " slots in a die block—
Putnam End Mills permit the maximum
speed and feed. In addition, manufac-
turing and heat treating methods assure
long, trouble-free service. Why not
prove to your own satisfaction—by ac-
tual use on your machines—that the
end mills which do "cut faster and last
longer" are produced by Putnam?

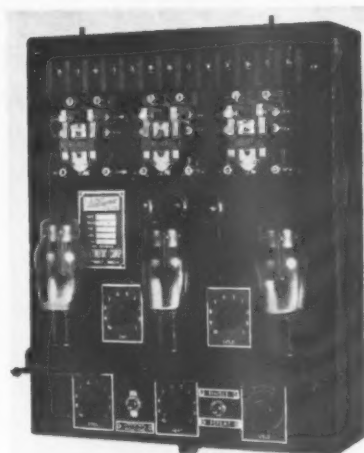
PUTNAM TOOL COMPANY

2987 Charlevoix Ave. • Detroit, Michigan

**WELTRONIC
IMPULSE TIMERS****(E79)**

To meet conditions where a single shot in resistance welding will not produce a satisfactory weld, a line of electronic impulse timers is offered by the Weltronic Corporation, Detroit. The line consists of a semi-automatic and a high speed automatic Weltronic timer. Both models employ electronic tubes, the individual dials being adjustable in single cycle steps in a range of from two to 20 cycles. Number of interruptions can be set from one to ten.

With these timers, it is said that welding operations extremely difficult heretofore can now be made with ease. This is claimed to be particularly true for the welding of relatively heavy sections such as are found in structural work, automobile frames, truck cabs, blowers, and farm implements. The interruptions of current give the points a chance to cool off, while at the same time pressure between the points squeezes the metal parts together to form a better contact and more perfect weld. Actual intervals between current impulses are short enough to prevent material cooling of



the sections at the weld, while permitting cooling of the welding point.

Three trouble lights are provided on the timer. These lights indicate quickly in what part of the welding system trouble may be found in case of imperfect operation of the entire welding set-up at any time.

**SHELDON
11 & 12 INCH LATHES****(E80)**

The Sheldon Machine Company, Inc., Chicago, announces that their new 11 inch and 12 inch lathes with pre-loaded ball or precision roller bearing headstocks will have a one inch capacity spindle hole having $1\frac{3}{8}$ inch diameter. These new lathes will be moderate in price and will come in both bench and floor types with semi-quick or full quick change gear boxes, with plain aprons or worm feed aprons with power cross feed, and with a choice of motor drives including the Sheldon Needle bearing overhead motor drive, and the Sheldon 4-speed lever operated underneath motor drive which is entirely enclosed in a cabinet leg. A complete line of attachments and accessories is offered for each of these new lathes.

**IDEAL
SCREW-TITE LUGS****(E81)**

A new solderless, Screw-Tite Lug is announced by the Ideal Commutator Dresser Co., 5074 Park Ave., Sycamore, Illinois. This lug is the set screw type made of seamless, pure electrolytic copper with a heavy brass check-proof shell that reduces heating. Full current carrying capacity is evenly distributed from wire to lug.

Eight sizes are available from No. 14 wire to 2,000,000 C. M. Cable. Each size is suitable for a wide range of wire. One or two hole types are available with square or round ends. The Lug is approved by Underwriters' Laboratories.

THE TOOL ENGINEER

"Ground from
the Solid
after
Hardening"

**To Your
Advantage**

Reclaim your CUTTING TOOLS
Everytime they become dull.
Get long, full service thru
Regrinding at low cost—or
In savings of 70% in money.
Never lose sight of actual
Dividends paid in less time,
Increased production, etc..
New Severance Designs, also,
Give lasting satisfaction.

Write for General Information, Sales
Bulletins, or Engineering Service for
Rotary Power Cutters—"Chatterless"
Countersinks—Tube Deburring Tools.

SEVERANCE TOOL COMPANY

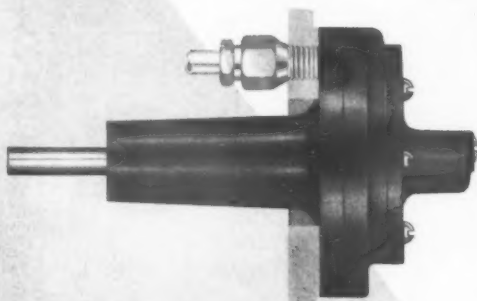
1510 East Genesee Avenue
SAGINAW, MICHIGAN

Lubrication *Can't* Fail with ROLLWAY PUMPS on the job

Today—lubrication **MUST** not fail—it's too vital a factor—production must go on without interruption.

Rollway Pumps are demonstrating their reliability in performance in the leading plants of the country—on high production work where positive lubrication must be insured.

The motion of Rollway Pumps is rolling—no gears to jam on foreign matter—operate efficiently at capacity when driven at low speeds—they develop high vacuum and may be set considerably above surface of liquid being pumped without danger of loss of prime.



Send for special Engineering Manual

**PIONEER ENGINEERING
AND MANUFACTURING CO.**

19647 JOHN R.

DETROIT, MICH.

SECOMET DIAMOND WHEELS

for...
FAST
Cutting
HIGH
Finish
LONG
Life!



With SECOMET Diamond Wheels, cemented carbide tools are sharpened in a fraction of the time required by other wheels...

Tools receive a more accurate, sharper, flatter surface, and no lapping is required...

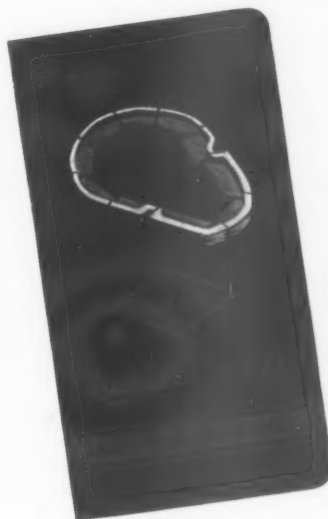
Tools may be reconditioned down to a minimum of tip thickness... Write for full details of any type of diamond wheel. No obligation.

J. K. SMIT & SONS, INC.

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Rings, Discs, Blocks,
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Tool Steel of all
Makes

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DETROIT, MICHIGAN

GARDNER HORIZONTAL GRINDER (E82)

A new No. 186-30" Horizontal Disc Grinder is announced by the Gardner Machine Company, 442 E. Gardner Street, Beloit, Wisconsin. This machine is adapted to numerous operations where simply a flat surface is to be produced, the ground area not being required to have a definite relation to any other portion of the casting. In addition, when equipped with a hand-operated swinging work table it may be used to produce two surfaces of one casting,

in an accurate relation with each other.

The machine carries a steel disc wheel 30" in diameter, traveling in a horizontal plane. This wheel is mounted on a substantial supporting flange, or wheel collar, 20" in diameter, fitted to the upper end of the main spindle. The machine is designed particularly to meet the requirements of those who prefer V-belt motor-driven equipment, and who favor the use of standard motors. A guard ring of new design, is set to the top of the machine base. To it may be secured work holders or special attachments. This ring is removable, in-

suring maximum convenience when mounting abrasives upon the steel wheel. The construction permits sections to be cut out to accommodate large work which may overhang the edge of the cutting member.

The new swing bar-type dresser pivots from a 2 $\frac{3}{4}$ " diameter shaft, which provides rigid support. The heavy arm supporting the bar is an inverted U-section,



ribbed to withstand all strain. The steel bar carries a ball-bearing dresser head with heavy spindle. When in use, the entire arm is swung into the center position and locked by means of two clamping screws, thus bringing the cutters on the center of the abrasive wheel. The operator then slides the head back and forth in the customary manner.

HOUGHTON OILS (E83) FOR GUN BARRELS

Ready-mixed cutting oils for drilling, reaming, and rifling gun barrels for small arms are announced by E. F. Houghton & Company, Philadelphia. The company has previously supplied a cutting base mixed in the user's plant with a suitable blending oil and fed under high pressure through the barrels during the drilling operation. The new oils are offered for plants taking on defense contracts and wishing to eliminate the possibility of error in mixing or diluting.

For drilling, Cutting Oil No. 5 is being used. For reaming and rifling, Cut-Max No. 1025, a light-colored non-staining oil, is supplied. For honing, Gun Barrel Honing Oil is replacing staple fatty oils, it is said.

PLEASE NOTE: The purpose of this department is to call to the attention of its readers new production ideas. To aid readers in getting complete technical data on any item in which they are interested a key number is given for use on the post card bound in this issue.

SPEED CASE & STEEL

A LOW CARBON OPEN HEARTH PRODUCT

Assures You...

1. UNUSUAL DUCTILITY

Speed Case can be riveted, peened, flared, bent or cold worked similar to other low carbon open hearth steels such as SAE X1020-X1314-15.

2. SMALLER INVENTORY

Due to Versatility of Speed Case

3. INCREASED PRODUCTION

40% to 80% Over SAE X1020-X1314, etc.

4. MACHINABILITY

Machines as fast as SAE X1112

5. CARBURIZING

Carburizes like SAE X1020

6. PHYSICAL PROPERTIES

Equal to SAE X1020-X1315-1115

JOBBER'S NOTE!

Reduce Your Inventory

SPEED CASE

the ALL PURPOSE Steel will allow you to reduce the number of different steels you are now carrying in your stock.

ASK US FOR DETAILS

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THE FITZSIMONS COMPANY
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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

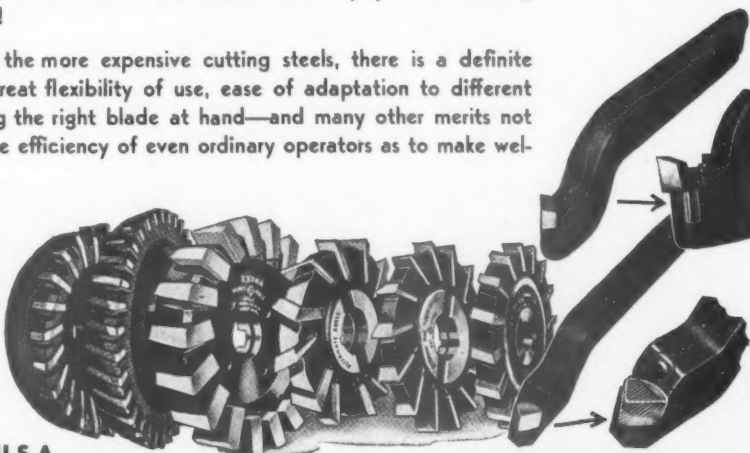
This is no time for "wheel chair" equipment!

**TODAY THE RACE IS TO THE SWIFT
THE PROFITS TO THE PRUDENT**

DUE to its lasting, inbuilt merits, every O K Inserted-Blade Metal-Cutting Tool you install not only steps up your production but becomes a sound investment that will pay dividends long after the world again resumes an even keel

As only the blades of O K Tools are made of the more expensive cutting steels, there is a definite saving at the very start. In addition, the great flexibility of use, ease of adaptation to different jobs, lost motions avoided by always having the right blade at hand—and many other merits not found in solid cutting tools—so increase the efficiency of even ordinary operators as to make welcome showings on the profit sheets.

For 100% results, we advise outfitting an entire metal-cutting department; but proportionate savings may be made by revising a machine or two at a time. If you will submit your problem to us, we will send you our engineers' recommendation and an O K catalog.



**THE O K TOOL COMPANY,
SHELTON, CONN., U.S.A.**



INSERTED-BLADE METAL CUTTING

TOOL SYSTEM

A GOOD PRESCRIPTION

for

**Production
Headaches**



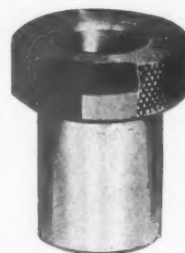
THE national defense program has made many new friends for Cerromatrix, the low-temperature-melting alloy that expands slightly on solidifying. For locating punch and die parts quickly and accurately, for making chuck jaws rapidly and inexpensively, for anchoring stationary machine parts without the time-consuming labor of making drive fits, and for many other tasks, Cerromatrix makes it possible to keep up with extraordinary demand. Send for our free Cerromatrix Manual describing many ways to use this valuable material.



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**RAPID
SAW FRAMES****(E84)**

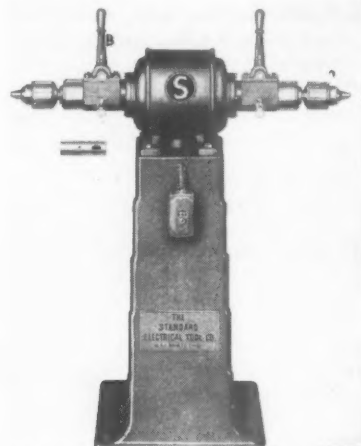
New, heavy duty hack saw frames, were recently introduced by Rapid Manufacturing Company, Glendale, California. This is said to be the only hack saw frame with a guard to prevent skinned knuckles from accidental contact with rough edges of sawed metal. Another feature is the patented automatic tension lock. By cam action in the handle, the blade is held at the highest tension of any frame, yet can be changed in two seconds.

In addition to the 'standard model, there is a combination frame, which can be changed in 30 seconds from conventional to taper position. This model is particularly suited to work in tight corners, on angle cuts, and for deep cuts below the level of the handle.

**STANDARD
SPEED LATHE****(E85)**

A double end arrangement has been added to the line of speed lathes of The Standard Electrical Tool Co., 1933 W. 8th St., Cincinnati. The construction of

this unit permits the spindle at each side to be operated at random, starting and stopping one side without interfering with the operation on the opposite end. Incorporated in each spindle housing is a combination clutch and brake



which is actuated either through hand lever or by foot pedal control. Simultaneous action disengages the clutch and applies the brake, instantly stopping the work spindle, while the motor continues to operate.

Increased production, due to the facility of quickly starting and stopping the work spindle, is said to be reflected by this arrangement. Each work spindle being independent of the motor shaft permits the motor to operate at all times, eliminating frequent starting and stopping, reflecting in lower current consumption and longer motor life with lower maintenance cost.

**SCHERR
COMPARITOL-INSPECTOSET****(E86)**

The George Scherr Company, New York, has just brought out its new Scherr Comparitol-Inspectoset Unit de-



signed especially for shops now engaged in the production of parts to very close

*To
cut
hole
costs*



YOUR drill press output can be accelerated with WIZARD Quick-Change Chucks and Collets. They permit changing tools without slowing or stopping the spindle. WIZARD Friction-Drive Collets permit tapping at high speeds, with safety.

McCrosky Tool Corporation
Meadville, Pa.



WIZARD
QUICK-CHANGE CHUCKS
Keep Spindles Producing

Ask for
Bulletin No. 15D



Drive out the Drones!

WHEN the going gets tough in a bee hive, the non-productive drones are driven out. But in a busy shop or factory, lazy machines become productive again when you tool them up with TECO. Put those drones back to work with TECO Tools and watch them go to town! Higher cutting speeds, finer finish, and less non-productive machine time, all go hand in hand to keep production humming, when you're tooled up with TECO Carbide Tools.

Here's why TECO CARBIDE TOOLS reduce costs and speed up production—often more than 75%.

Rough and finish in one cut • 10 to 50 times more pieces per grind • Machine steel up to 550 Brinell—without annealing • Reduce floor to floor time up to 30% • Increase tool life as much as 200%.

TECO METAL is available in grades suitable for cutting almost any machinable material. Ask for a shop demonstration without obligation, and use Teco's consulting service whenever there's a tool problem to solve.

Tungsten Electric supplies Carbide Blanks, Tools and Bits, Wire and Bar Dies, Tubing, Extruding and Sizing Dies, also special tools such as Spot Facers, Reamers, Combinations, Broaches, Forming Tools, and TECO METAL for hard-surfacing parts subject to unusual loads.

TUNGSTEN ELECTRIC CORPORATION • 570-39th STREET, UNION CITY, N. J.

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Pioneers in Tungsten Carbide for over a Quarter of a Century



TECO CARBIDE TOOLS *pay dividends!*



DE-STA-CO ARBOR SPACERS

They save time in setting up cutters on milling machines and other tools. Will help you get work out quicker. Low in cost, but high in savings. Standard stock sizes from .001" to .125" thick. Also specials up to 4.000".

TRIAL ASSORTMENT

Enough spacers for average use on one machine, sent for \$1.00. Give arbor size when ordering.

Price list No. 70 sent free

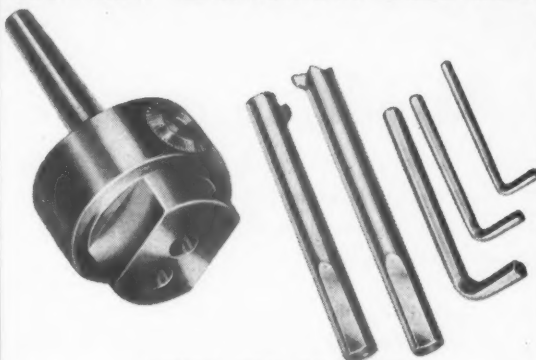
DETROIT STAMPING CO.

Established Over 25 Years

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FRAY MICROMETER OFFSET BORING HEADS



WRITE FOR BOOKLET

FRAY
MACHINE TOOL CO.

Makers of

"ALL ANGLE"
MILLING MACHINE &
MILLING ATTACHMENTS

505 W. Windsor Road

Glendale, California

tolerances. This unit is said to enable the shop to maintain complete control over all shop gauges, mass produced parts, ball bearings, pins, and other parts. Included in the unit is the Comparitol which is graduated to read to 1/10000" plus and minus .002" and the Ultra-Chex Inspectoset consisting of 34 gauge blocks which will make up all combinations in steps of 1/10000" from .300" to 8". The Inspectoset comes in a specially designed polished case to hold this and other gauges.

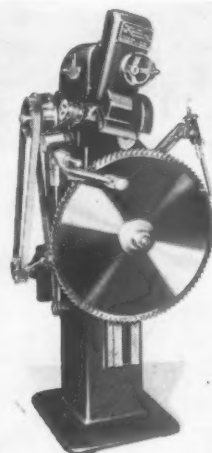
The Comparitol is first set with the Ultra-Chex in the Inspectoset, after

which parts can be checked quickly and easily to 1/10000" by unskilled help, it is claimed.

MOTCH & MERRYWEATHER SAW GRINDER (E87)

The Motch & Merryweather Machinery Company, Cleveland, has developed an Automatic Saw Grinder for sharpening its segmental saw blades. Rigid construction and automatic indexing are said to assure rapid, accurate sharpening. The drive is obtained by means of

a single electric motor through belts. The drive is completely enclosed and protected against the entrance of dust. An oil pump provides lubricant to all internal moving parts. The wheel spindle and wheel slide are located in the same plane, eliminating overhang and



minimizing vibration. Accurate pitch is effected without complicated devices and by an indexing disk. Fast speed for fine pitches and small-diameter saws and slow speed for larger saws are accomplished through sliding gears. Alternate high and low teeth can be ground in one setting by positioning a lever on the left-hand side of the machine. All operating controls can be actuated while the grinder is running.

DOALL JOB SELECTOR

(E88)

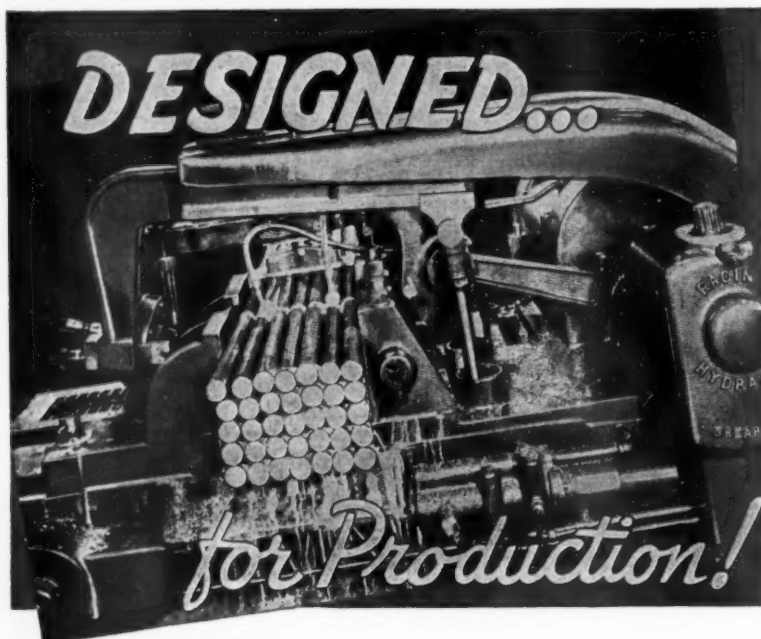
Recognizing the increase in the use of alloys, Continental Machines, Inc., Minneapolis, has introduced a new job selector for ready reference to all basic materials which are to be contour sawed or filed.

The new Job Selector contains 56 basic materials ranging from ferrous to non-ferrous materials. A flip of the operator's hand brings to view the correct sawing speed, saw pitch, saw temper, and saw set to get the most economical performance from the machine.

Additional items contained on the Selector cover oiling directions for the DoAll machine, the minimum width of saw to use in cutting contours of various radii.

The new Job Selector has been incorporated on all the DoAll sawing, filing, and polishing machines. Cardboard replicas have been prepared and are available upon request.

The elimination of light glare from the dial of the model mounted on the machines is accomplished by curving the surface.



RACINE METAL CUTTING MACHINES

are designed for sustained production. Day in and day out RACINE Heavy Duty Hydraulic Saws are setting entirely new standards in the cutting of bar stock—structurals—die blocks—in steel mills—shipyards—production plants—wherever metal cutting jobs are tough.

Smooth, oil cushioned operation gives added blade life and maintains unequal production rates. Finger-tip hydraulic control reduces stock handling time. Compact, rugged construction means longest life.

RACINE Largest line—full range of types, sizes, and capacities. RACINE Heavy Duty Hydraulic model 10 x 10 up to 14 x 20. RACINE Shear Cut 6 x 6, 8 x 9. RACINE Hydraulic Oil Cut 6 x 6. RACINE Utility Hydraulic Saws wet and dry cut types, 6 x 6, and RACINE Fully Automatic Hydraulic Saws. Performance records upon request.

RACINE TOOL AND MACHINE COMPANY
1777 STATE ST., RACINE, WISCONSIN

New Vernon No. "O" HORIZONTAL MILL

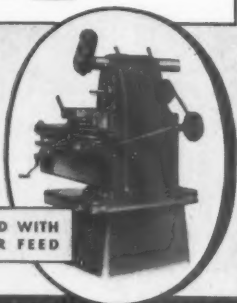
The most efficient low cost machine available for fast, accurate milling of smaller parts.

Choice of two standard speed ranges—100 to 1000 RPM or 150 to 1500 RPM.

FULLY ENCLOSED VARIABLE DRIVE permits instant change of spindle speed within these ranges.

PROMPT DELIVERIES.

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ALSO AVAILABLE EQUIPPED WITH LONGITUDINAL POWER FEED



MACHINERY MANUFACTURING CO.
1915 E. 51 ST. VERNON, LOS ANGELES, CALIF.

The Vernon Line of HORIZONTAL MILLING MACHINES, VERTICAL MILLING MACHINES & JIG BORERS, and 11" SHAPERS

APEX -PHILLIPS

HAND DRIVERS



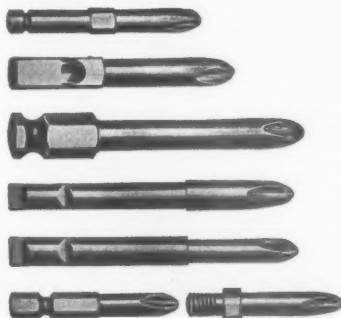
Made in two types—General Purpose and Super Service. Super Service Drivers are for case-hardened, self-tapping screws. Available for all sizes of Phillips screws and in "Stubby" drivers for close quarters work. Both types and all sizes can be had with transparent break- and shock-proof handles.

"L" Drivers for Phillips screws are made for all sizes Phillips screws and in single and double-end drivers.

Service Drivers are available for assembly tee handles, ratchets, extension shanks, speeder handles, etc.

Hand Brace Bits are made for all sizes of Phillips screws with either Super or General Purpose blades.

and POWER BITS



APEX - Phillips Power Bits are made of a special shock-resisting steel, heat treated to give maximum hardness, toughness and wear resistance. Special bits are made for case-hardened, self-tapping screws.

APEX Power Bits are available for nearly all makes of electric, air and spiral drivers for Phillips, Slotted Head and Clutch Head screws.

GAMMONS OF Manchester



PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOLMAN CO., MANCHESTER, CONNECTICUT

JULY, 1941

The
APEX MACHINE & TOOL
Company

1101 Patterson Blvd. Dayton, Ohio

**ALCO
DIE HOLDER****(E89)**

The Alco Tool Company, of Bridgeport, Connecticut, has recently announced that it is now in production on a new releasing model acorn type die holder for hand screw machines and turret lathes. This new model has the same adjustable concentric alignment feature as the model used for automatic screw machines.

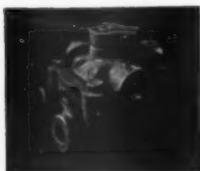
The Alco engineers claim that this new model is one of the most outstanding precision constructed tools they

have built.

It is the only acorn type releasing model die holder with the adjustable concentric alignment feature. Because no pins are used, it is rigid in construction, it is said. Old machines with badly worn turrets and sloppy bearings are claimed to produce perfect work with this new tool. A ground bearing surface in the nut contacts a similar ground surface on the body, assuring alignment of die regardless of thread fit. It provides for quick and positive set-up of die concentric with the work, it is said.

NOPAK VALVES*Lifetime
PROTECTION**Against*

- Leakage
- Maintenance
- Packing Replacement



There is a NOPAK VALVE ... hand, foot or Solenoid operated ... for every control problem.



NOPAK Heavy Duty Air Cylinders have chrome iron heads bolted directly to welded flanges. Mirror-finish bore... hard chrome if desired.

The NOPAK patented flat-disc principle results in the simple, rugged construction which makes NOPAK Valves practically leak-proof and wear-proof. The perfectly lapped surfaces of the disc and seat, constantly shielded from dirt and grit, actually improve with use, as does the packless stem assembly.

As a result, NOPAK Control Valves for Air or Hydraulic Service eliminate the common causes of valve leakage, pressure loss, and valve failure due to excessive wear. They help you eliminate maintenance expense, costly shutdowns, in these days of full-speed production. Write for Bulletin 65.

GALLAND - HENNING MFG. CO.
2757 S. 31st STREET MILWAUKEE, WISCONSIN

NOPAK

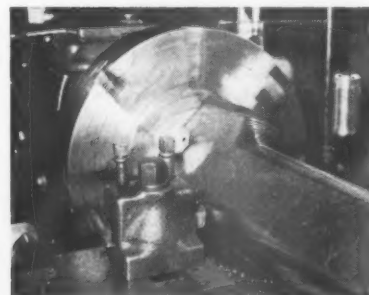
Representatives in Principal Cities

VALVES and CYLINDERS**DESIGNED for AIR or HYDRAULIC SERVICE**

A 3393-1/2

**CARBOLOY
MACHINES ARMOR****(E90)**

Fast machining of cast armor plate—a difficulty in tank production—may be speeded shortly as the result of experiments involving the use of tungsten carbide cutting tools. Above, a test 'billet'



of armor plate being machined with one of these tools at the plant of the Carboloy Company, Inc., Detroit, tool subsidiary of General Electric.

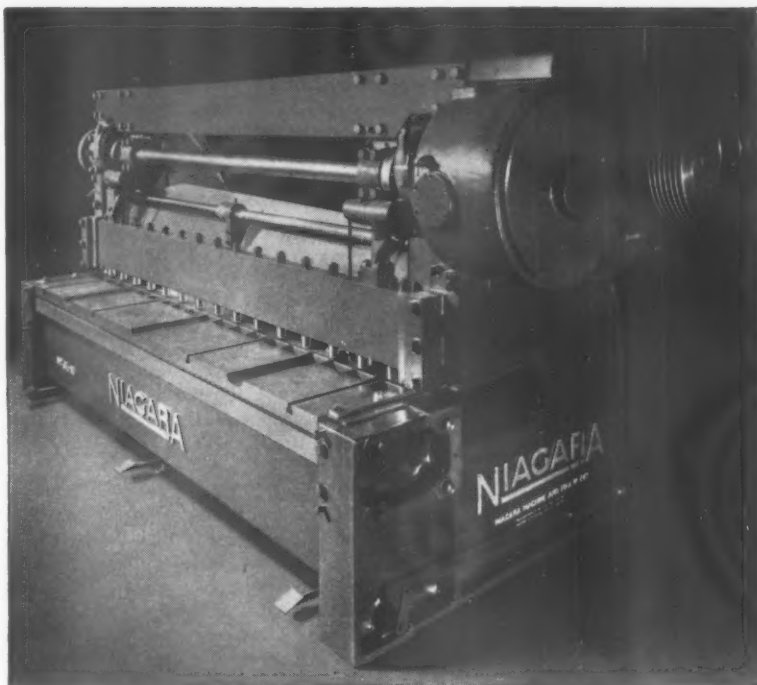
**ACROMARK
COLD STAMPING****(E91)**

An interesting application of the cold stamping process of the Acromark Corporation, Elizabeth, New Jersey, is that illustrated. Shown is a section of angle iron cut from a steel bed frame, and the dies, type, and holders used for stamping this angle iron. The piece shown

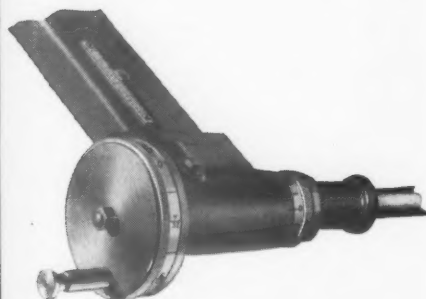


was cold stamped after 10,000 impressions had been made.

The two holders assembled with type and the one solid die were placed into a 125 ton press and the entire impression was made at one stroke of the press. These angle iron frames were made from reclaimed railroad track which is extremely hard in some places, due to the continual hammering of car wheels. In some instances the angle iron ran as hard as Rockwell "C" 40.



America's foremost industries including aviation, automotive, and all branches of the metal stamping field as well as steel warehouses are using Niagara high production power squaring shears. More working strokes per hour are the result of their convenient arrangement for handling sheets and off-cut material... accessible control... quick, accurate setting of self-measuring, ball bearing parallel back



Close-up showing convenient arrangement of Niagara self-measuring, ball bearing parallel back gage. It provides quick setting to 1/128 inch. The sliding sleeve on the connecting shaft makes possible independent adjustment of either side of gage for taper cutting.

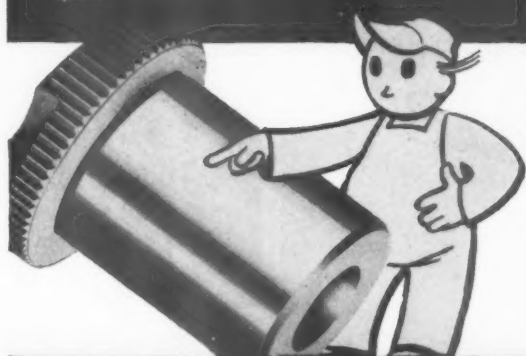
gage... instant acting sleeve clutch.

Clutch and driving mechanism are mounted in oiltight case assuring perfect lubrication, long life and low maintenance cost.

Write for Bulletin 72. Niagara Machine & Tool Works, Buffalo, N. Y. Branches: Cleveland, Detroit, New York.

FOR ACCURATE DRILLING YOU CAN'T BEAT UNIVERSAL DRILL BUSHINGS . . .

Super-finished bore straight and round within .0001 assures accuracy and unexcelled wearing qualities. Nickel steel lock screws provide extra strength. Cadmium plated screws prevent rusting. Knurled head allows better grip. Black dome improves appearance, resists rust. Write for data sheet.



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The Model A600 Tool and Cutter Grinder
Our bulletin TCG41-7TE gives you all details.

K. O. LEE COMPANY
Aberdeen, South Dakota, U.S.A.

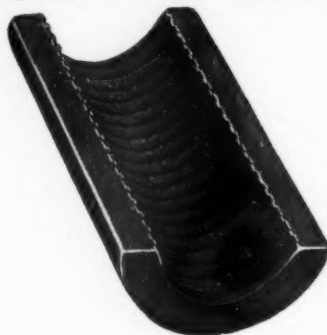
BRIGHTBOY HALF ROUND TABLET

(E92)

Designed to speed the finishing and polishing of curved surfaces, is the half round Brightboy Tablet just developed by the Weldon Roberts Rubber Co., Brightboy Division, Newark.

This new item is made in the same compound as the other Brightboy products, a soft rubber binder which cushions the abrasive. It is semi-circular in cross-section and both inner and outer surfaces may be used, and the inner surface is corrugated for faster action.

Almost as pliable as a rubber eraser Brightboy Half Round Tablet may be



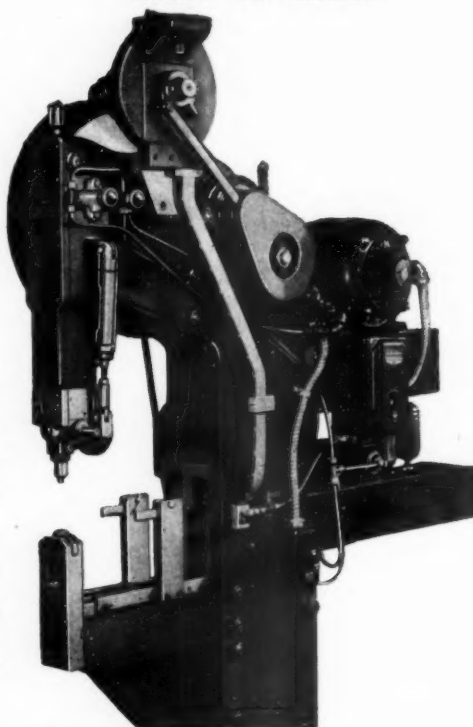
*pierces
and
rivets*

AUTOMATIC FEED "RIVET-PIERCE" RIVITOR

(the new "RK" machine)

The previously unpierced work is driven down over the underfed rivet—punching a slug out of the work. The rivet is then set at the next stroke of the machine.

Handles rivets of sizes up to .140 dia. x 1/4" long. These may be of any flat head type such as "coopers" or "tinnets". The size mentioned above can be set in total maximum work thickness of .075.



write for particulars to
THE TOMKINS-JOHNSON COMPANY
624 N. Mechanic St., Jackson, Mich.

this is a **TOMKINS-JOHNSON** product

compressed by the hand to conform to the diameter of tubing or shafting, or it may be squeezed into the hollow of tubes, bushing, or flanges. It finishes and polishes these surfaces quickly and effectively, it is claimed.

PLOMB FIRMBACK HACKSAW

(E93)

A new type of hacksaw, to be known as the Plomb Firmback, with frame designed so that it can be set at any angle with the pistol grip handle, and adjustable blade mounts that keep the blade straight at all times, is announced by the Plomb Tool Company, Los Angeles.

The pistol grip handle is so mounted on the frame as to give direct push and pull action on the blade. It can be turned to any position to get close-up cuts in spite of obstructions. The blade can also be turned and positively set at any angle, increasing the ability of this tool to reach ordinarily inaccessible places, it is claimed.

The frame is adjustable to take all popular lengths of blades, and the blade mounts are movable up or down, on the legs of the frame.

BURGESS FACTORY BOOTH

(E94)

A new model of the Burgess Acoustical Telephone Booth was recently announced by the Burgess Battery Company, Chicago. This model has no doors, but is lined with a heavy layer of sound absorbing material protected by perforated steel facing developed by the Burgess Laboratories. Owing to acoustical construction, factory noises and disturbances are absorbed so completely by the lining that telephone calls



can be made without interruption from factory noises, it is said. Conversations in ordinary tones are not heard outside the booth, thus assuring privacy. Added advantages are ample ventilation, due to its open construction, and freedom from door troubles.

THE TOOL ENGINEER

Get the
INSIDE STORY
on Mac-it hollow set screws!

It's what you **don't see** in a hollow set screw that shows up in service. Here are a few of the "hidden qualities" packed into every Mac-it.

Produced from electric furnace steel, Mac-its are milled from solid bars to insure accuracy. Each angle of the sockets is accurately **cut** to insure positive key engagement.

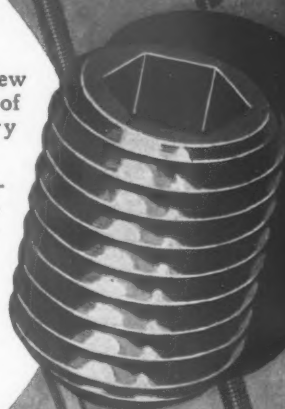
Every Mac-it shown here is standard. For details call your Mac-it distributor or write us direct.



LOCK IT!

Hollow lock screws are available for use with hollow set screws. Positive action is insured.

6



THE STRONG CARLISLE & HAMMOND CO., Cleveland, Ohio

AMES

Hundred Series
DIAL INDICATORS

Entirely new Indicators in four sizes with choice of fourteen different dial numberings.

All dimensions and characteristics to American Gage Design Committee specifications. Choice of jeweled or plain bearings in all models. Shockless wheel assembly optional.

Described with many other models in the new Catalog No. 52.

Send for Your Copy Now.

B. C. AMES CO., WALTHAM, MASS.

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**FLOATS
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**DEMAND THE
ZIEGLER**

ROLLER DRIVE

**Floating Holder
for**

Taps and Reamers

AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.

Helps produce unbelievable accuracy on both new and old equipment.

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.



W. M. ZIEGLER TOOL CO.
1920 Twelfth Street **DETROIT**

New Literature

Of Interest to the Tool Engineer

(212) Hydraulic Cylinders

Hanna Cylinders For Power Movement. 28 pp. Hanna Engineering Works, 1765 Elston Avenue, Chicago. This catalog shows the full line of Hanna Cylinders, together with valuable engineering data and specifications. Also included is information on control valves and hoists.

(213) Socket Screws

Standards for Socket Set Screws and Socket Head Cap Screws. 12 pp. The Holo-Krome Screw Corporation, Hartford, Conn. This catalog includes standards approved by the American Standards Association and sponsored by the Society of Automotive Engineers and The American Society of Mechanical

Engineers, for socket set screws, socket head cap screws, socket screw keys and the formulas for determining all dimensions. Also included are screw thread data and body length tolerances.

(214) Milling Cutters

Lovejoy Milling Cutters. 20 pp. Lovejoy Tool Company, Inc., Springfield, Vermont. This catalog covers the company's complete line of milling cutters.

(215) Screw Machine

Polymatic High Speed Screw Machine. 6 pp. Unit Machinery Company, Rockford, Illinois. This folder contains illustrations, descriptions, dimensions, and specifications of this newly designed machine.

(216) Tool Steels

Rex, VM, MM, TMO. Three 4 pp. folders. Crucible Steel Company of America, New York City. With the impending shortage of tungsten, there is particular interest in the partial substitution of molybdenum high speed steels, three grades of which are described in these folders.

(217) Boring Machines

Simplex Precision Boring Machines. 12 pp. Stokerunit Corporation, Milwaukee, Wisconsin. A number of new machines and illustrations of tooling are shown in this folder to give a better idea of the adaptability and flexibility of these boring machines. Detailed specifications are included.



Shop men prefer it—
Automatic retracting—
No stopping or indexing—
Easy to adjust—
More pieces per grind—

The Moline Automatic Retracting Boring Head retracts the single-point cutting tool a few thousandths of an inch upon completion of a bore so that no tool drag occurs during withdrawal of the boring bar.

In addition to a micrometer adjustment for tool setting, a superfine adjustment is provided which permits the operator instantly to increase or decrease the diameter of the bores by amounts which must be measured in ten-thousandths of an inch. These small changes in diameter are accomplished without loosening the tool bit which remains clamped in position until regrinding becomes necessary.

Regardless of the tools which are used, an accurate machine is the basis for precision work. When these patented boring heads are used on Moline multi-spindle, precision boring machines the resulting accuracy, convenience and efficiency are difficult to duplicate with any other equipment.

MOLINE TOOL COMPANY
MOLINE, ILLINOIS

ESTABLISHED 1901

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Booklets listed in these pages or information on new equipment may be obtained by using the post card bound in this issue. Merely fill out one coupon for each item desired, being sure to print plainly and to include position and company. Mail the card to us and you will receive the information desired at once.

(218) Rifle Drilling

Multi-Spindle Rifle Drilling, and The 410 Rifle Driller. Two four page folders. W. F. & John Barnes, Rockford, Illinois. Illustrations and description of two new machines for drilling rifle barrels, one of which is capable of handling 6 barrels simultaneously.

(219) Drilling Machines

Duplex Horizontal Drilling Machine. 6 pp. Morey Machinery Company, Inc., New York City. Illustrations, description, and specifications of two models of Morey Deep Hole Drillers.

(220) Welding

Thermit Welding. 32 pp. Metal & Thermit Corporation, New York City. This booklet describes the Thermit welding process and its application. It

THE TOOL ENGINEER

LITERATURE

is well illustrated, and includes information on the physical properties of Thermit welds.

(221) Electric Tools

Electric Grinders, Buffers, Drills. 36 pp. The Standard Electrical Tool Company, 1933 W. 8th Street, Cincinnati. Detailed description and illustrations are included in this catalog.

(222) V-Belt Drives

Veelos Picturegraph. 24 pp. Manheim Manufacturing & Belting Company, Manheim, Penna. This folder shows almost entirely by means of pictures the educational ideas involved in this unusual V-belt Drive.

(223) Flat Belt Drives

Selection and Maintenance of Rubber Transmission Belts. 12 pp. B. F. Goodrich Company, Akron, Ohio. This comprehensive booklet is a guide to the application and care of flat rubber belting.

(224) Surface Grinding

Precision Surface Grinder. 6 pp. Covell Manufacturing Company, Benton Harbor, Michigan. A detailed description of the features, illustrations, and specifications of the Covell No. 20 Surface Grinder.

(225) Roll Feeds

Wittek Roll Feeds for Punch Presses. 24 pp. Wittek Mfg. Company, Chicago. This bulletin contains complete information on automatic roll feeds that provide an improved and simplified method of punch press operation, assuring rapid feeding under all conditions, it is said.

(226) Die Cushions

New Improved Dayton Rogers Universal Pneumatic Die Cushion. 4 pp. Dayton Rogers Mfg. Company, Minneapolis. Brief description, illustrations, and specifications of the Model D Die Cushion.

(227) Tool Chests

GS Tool Chests. 4 pp. George Scherr Company, New York City. Illustrations and description of these tool chests for tool makers, machinists, and craftsmen.

NEW BOOKS

Gears & Gear-Cutting, Edited by F. J. Camm. 144 pp. \$2.00. The Chemical Publishing Company, Inc., Brooklyn, New York. This new book deals with methods of cutting all types of gears, including spur gears, helical gears, worm gears, bevel gears, spiral and screw gears. The book includes all formulae, tables and information on the

JULY, 1941

Outstanding For • ACCURACY

• STRENGTH
• LONG LIFE



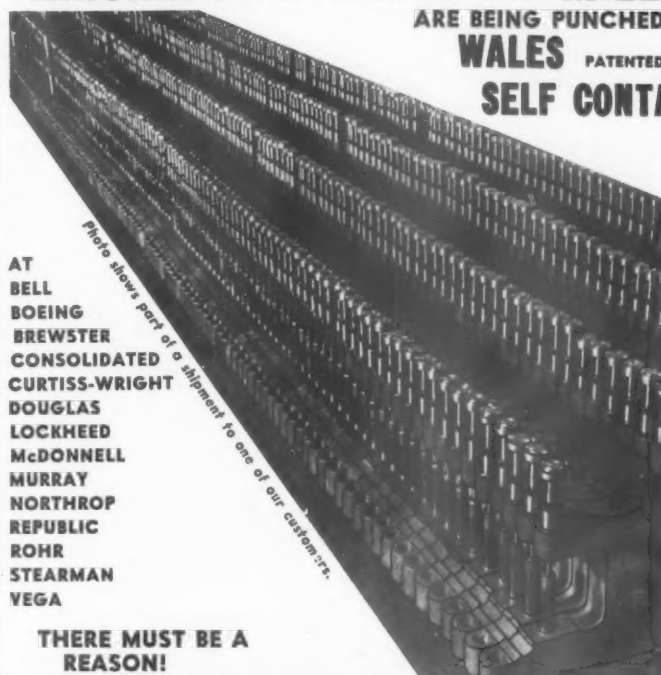
Now, more than ever before, AMERICAN is producing finer cutting tools to meet the demands of strict defense requirements. Reorders are less frequent due to expert tool design which allows extra tool life.

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ROHR
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THERE MUST BE A
REASON!

FOR FURTHER INFORMATION WRITE
THE STRIPPIT CORP. 1200 NIAGARA ST., BUFFALO, N. Y.

making of end-mills, hobs and gear generating cutters. There are more than 100 illustrations reproduced by the offset process.

Manual on the Cutting of Metals. Prepared by ASME committee on metal cutting data. 320 pp. \$5.00. American Society of Mechanical Engineers, 29 West 39th Street, New York City. This book represents the results of five years of intensive laboratory and shop practice experiments, supplemented by a survey of every important investigation on the art of cutting metals during the

last twenty years. It includes 245 tables of data covering the machining of 35 commonly used steels by seven differently shaped tools; the cutting speed and the horsepower required for seven speeds varying from 0.002 inch to $\frac{1}{8}$ inch, each for nine depths ranging from $\frac{1}{32}$ inch to one inch; an extensive table from which values may be derived for a more complete list of 289 steels and conditions; tables of data to enable one to compute similar information about the turning of 29 cast irons and 34 non-ferrous metals; and instructions for applying the data and illustrative

examples showing the application of the data.

Modern Metallurgy for Engineers by Frank T. Sisco, Metallurgist and Editor, "Alloys of Iron Research, The Engineering Foundation." 430 pp. \$4.50. Pitman Publishing Corporation, New York. From his intensive research, wide practice of metallurgy and experience in teaching metallurgy and metal testing to officers of the U. S. Army Air Corps, the author provides essential data on the engineering properties of metallic materials, the variables affecting these properties and their significance to engineers. He shows briefly the relation between constitution and structure of materials and properties in an elementary discussion of fundamental modern concepts of physical metallurgy. Both ferrous, and non-ferrous metals are treated.

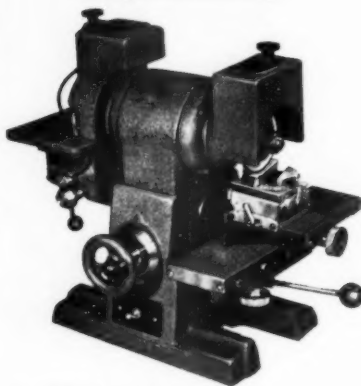
Lessons in Arc Welding. 176 pp. \$5.00. The Lincoln Electric Company, Cleveland. This book makes available to industry and to engineering colleges and universities, also trade and vocational schools, the accumulated welding instruction information from the Lincoln Welding School, which has been in continuous operation for 24 years. This revised edition should be helpful to beginners learning to arc weld, and to experienced welders desiring its comprehensive practical information, as well as to welding officials, such as supervisors, foremen, and instructors.



HAMMOND "4" CHIP BREAKER GRINDER

"By-Guess-and-by-Gosh" grinding of Chip Breakers into Carbide Tools has no place in Defense production. You'll get hair-line precision with HAMMOND'S Modern "4" Chip-Breaker Grinder. Three planes of adjustment with the new ANY-ANGLE vise. Left side of machine rough or finish grinds . . . right side grinds chip-breakers. Here's complete Carbide Tool maintenance.

Write for Bulletin GP-5.



Hammond of Kalamazoo

HAMMOND MACHINERY BUILDERS, INC.
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Eastern Branch - 71 West 23rd Street, New York City

Greenfield Gage Plant Quadrupled

A new plant, which more than quadruples the company's gage productive facilities, has been completed by the Greenfield Tap & Die Corporation. The plant was started last November. It is two stories high of brick construction, windowless, with two tiers of glass brick on two sides.

All finishing operations after heat treating are concentrated in the plant. The entire building is air conditioned throughout with humidity control of the air and elimination of atmospheric and manufacturing dust.

Fluorescent lighting has been installed throughout the building, maintaining a uniform average intensity of 25 foot candles, with intensities up to 65 foot candles, on equipment and at final inspection.

A careful flow chart analysis of product movement, both for the new building and for the starting or "soft" operations, governed the layout.



Model 100 - Self-Priming Vertical Mounting

Model 200 - Self-Priming Side Wall Bracket Mounting

Model 400 - Motor Feet Mounted

Model 500 - Submersible

Model 300 - Flange Mounted

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Keep production high with **BRADY - PENROD** Coolant and Circulatory Pumps - motor driven, open impeller, centrifugal type. If you get poor results from standard pumps, let us produce the special type you need for volume business. Our pumps have hydraulic efficiency as high as 70%. They are designed to eliminate wear on the pump; reliable for use with abrasives. Equal efficiency maintained, pumping water or light oil. All five models available with separate rating established at 400 SSU; 750 SSU; 1250 SSU; 2000 SSU.

1/8 H.P. MOTOR REPLACES 1/4 H.P. - through superior pump design. All motors have 20% surplus power.

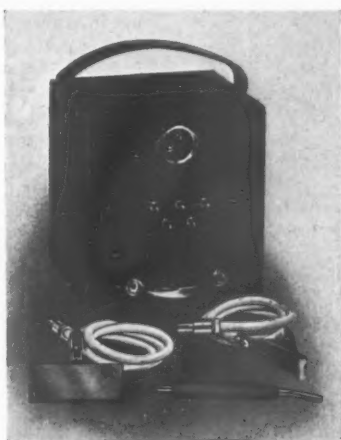
CAPACITIES: 1/2" to 2" pipe; 4 to 100 gallons per minute. Special models for larger capacities. Pressure up to 100 feet head.

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1216 W. Second St. MUNCIE, INDIANA.

Mark Iron,
Steel and
Carbides the
Etchograph
Way

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NEW JUNIOR MODEL

Buy the Original Electric Etcher

Three sizes to meet all requirements. Also a combined Etchograph and Demagnetizer.

With New ELKONITE TIP Pencil

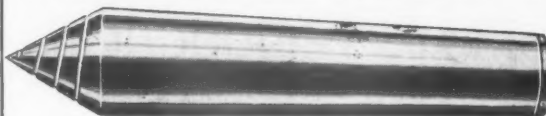
Mark hardened parts tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides - quickly - plainly.

Write for circulars and prices.

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Operators Using

CMD — Helical Groove
— CENTER POINTS —
and
CENTER POINT LUBRICANTS?



CMD HELICAL GROOVE LATHE CENTERS and CENTER POINT LUBRICANTS can play an important part in increasing production in your plant. A letter will bring a sample of oil to you for

test — and complete information on these centers. It will mean saving in dollars — time — effort.

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1928 W. 46th Street
CHICAGO ILLINOIS

Handy Andy Says—



THE Society growing apace, and with it, the circulation of THE TOOL ENGINEER, it might be a pat reminder that this column is primarily written for the members and friends of the A.S.T.E. A bit personal, at times, as I exchange amenities with

friends, and usually in a lighter vein designed to relieve the strains of the daily grind. Yet, impromptu mention of names and places oftentimes evoke responses from beyond our immediate circle. For instance, an offhand mention of my Alma Mater (Upsala College) netted me some interesting correspondence with Dr. Evald B. Lawson, President of Upsala, with a request that I write an article on the early history of the college. Along with that, he sent me a copy of the *Swedish Engineer*, organ of the Sw. Eng'g. Soc'y. of America. And the first (and very interesting) article I came across was written by A.S.T.E. Charley Koebel, Prex

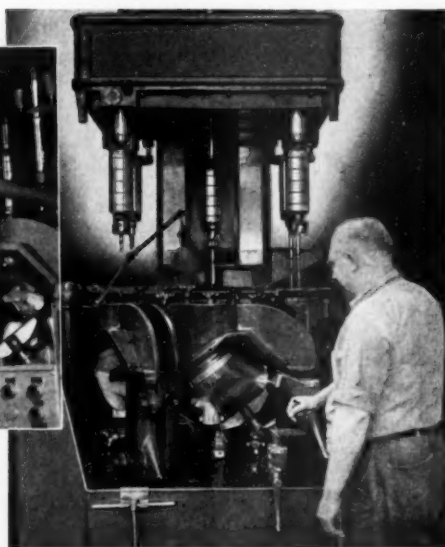
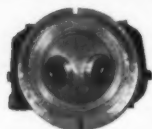
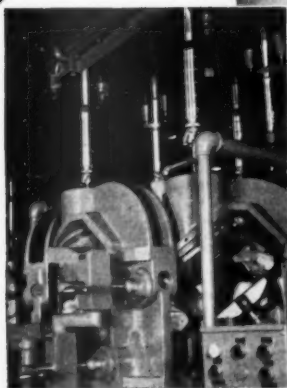
of Koebel Diamond Tool Company, Detroit. A roundabout way to meet a friend in the home town, eh? Well, okay, Dr. L.; you'll find the stuff asked for on your desk when you get back from your summer's vacation.

Had a letter from Otto Winter, veteran A.S.T.E. who, as you all know, is our 2nd V.P. and Ch'man of the Emergency Defense Training Committee. He says I'm all wet about him being able to read my handwriting but asks for more regardless. Okay, Otto, but wait your turn. But you know, I think The Society made a wise choice when they put him at the head of the E.D.T.C., to go alphabetical. Otto is a really good executive who can get a lot of work out of people, as I found out when he was Ch'man of the Detroit Chapter. I was secretary of No. 1 at the time, and about every other meeting I had to double as Ch'man until the unions kicked about me holding down two jobs. But that's okay and we had a lot of fun besides (if my memory serves me right) pulling Detroit out of the red and thus giving the succeeding staff a start from scratch. Anyway, Otto is all enthused over the Defense Training and, you know, enthusiasm is the spark plug of action. Besides, Otto knows the game. Well, go to it, ol' timer; I'm betting on you to get results.

Whenever opportunity afforded, I've put in a plug for the youngsters, having fond recollections of a helping hand from my seniors during my own industrial adolescence. So, I'm passing past favors along, especially when the prospect looks promising. Just heard that Einar Almdale, Jr., is Tool Engineering for Carbology Company, which was a recent (and very entertaining) host to Detroit Chapter and of which W. G. Robbins is Prex. Now, I've seen Einar, Jr. grow up from a gangling stripling to an engineering graduate of U of M, and I think he'll go places, being very much a chip off the old block. "Almy", Sr., came up the hard way same as a lot of us and did a pretty good job in the self making, being a very progressive Wks. Mgr. with advanced ideas in the field of mass production. Like father, like son, and Junior got started right by marrying young and is now eligible for a card on Father's Day, all of which presumes a sense of responsibility. On your way, young fellow! You're with a swell outfit and the sky's the limit. Good luck!

There must be some magnetic attraction up Toronto way, from what I hear about all the interesting meetings the boys hold up in the Province. Perhaps it's those feminine Tool Engineers that we read about in the papers, eh? Well, perhaps I'd better sashay Torontoward

Gairing in Aviation



MASS PRODUCTION

within tolerances of .0005 of an inch

In these machines, Gairing Carbide Tipped Tools perform a variety of operations on valve guide holes and valve seats in aluminum alloy Wright Cyclone aircraft engine cylinder heads.

They core-drill, counterbore, face, ream and chamfer on roughing, semi-finishing and finishing operations -- all within tolerances of .0005 of an inch.

Gairing engineers will gladly assist you with similar problems involved in programs of Peace or National Defense.

Use them!

The GAIRING TOOL CO., Detroit, Michigan

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SPECIALISTS IN FINE CUTTING
TOOLS FOR 24 YEARS

YOU WILL GET BETTER WELDS THIS WAY!

C-F Positioners permit "down-hand" welding at every point.

Any size or any shape of assembly can be accommodated on a C-F Positioner with just one set-up. It rotates and tilts the work so that "down-hand" welding may be done on top, bottom and sides by one man without any help after the assembly is once mounted.

Positioned welding not only gives better welding but it increases production, saves time, lessens accident hazards and makes every phase of the operation more economical. Write today for our Bulletin WP 20 which shows how and tells why.

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1318 S. Kilbourn Ave., Chicago, Ill.
Gentlemen: Please send me circular WP 20.

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Title.....

Address.....



CULLEN-FRIESTEDT CO.
1318 S. KILBOURN AVE. CHICAGO, ILLINOIS

Have You a Question?

... to ask about any items of new equipment described in this issue? Would you like to know more about them? Are any of the pieces of new literature listed likely to be of value? If so, just fill out a coupon on the post card folded in this issue and put in the identifying number printed with each item in New Literature and It's New. Mail us the card and we'll do the rest.

THE TOOL ENGINEER

"America in the Making"

EVANS HIGH SPEED STEEL REAMERS

WILL SHIP ON
30 DAYS' TRIAL

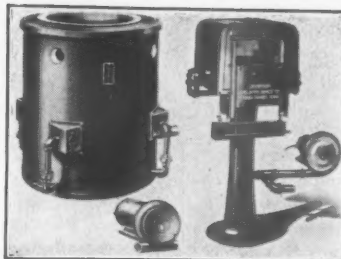
LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

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EVANS FLEXIBLE REAMER CORPORATION
4539 Ravenswood Ave., Chicago, Ill.

JULY, 1941



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Delivery

No. 570 Pot-Hardening and Melting Furnace

A unit that will pay for itself in record-breaking time, for it saves up to half the gas other furnaces demand. Produces maximum temperatures quickly. Most economical for lead, cyanide and salt hardening, zinc, aluminum and nickel-silver melting. Equipped with G. E. motor, Johnson blower and 14 x 20 steel pot. Prices on request.

No. 130 Hi-Speed Heat-Treating Furnace

Consistently develops 2300° F. in 22 minutes, in accurate tests. Specially engineered for the proper heat-treating of high speed steels, hardening punches, dies, tools, etc. Fire-box heavily lined with insulating refractory. Write for full information and prices.

JOHNSON Furnaces are setting the pace in giving maximum temperatures quickly, at low cost.

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JOHNSON GAS APPLIANCE Co.
603 E Ave. NW.,
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FOR EVERY INDUSTRIAL PURPOSE

"Green" operators gage accurately to fractions of .0001" using

COMTORPLUG

A patented expanding internal gage, giving **AUTOMATIC ACCURACY**. Self-aligning and self-centering. 2-point gaging. Not a passing reading. Shows actual size in fractions of .0001"; also detects back or front taper, out-of-round, bell mouth, barrel shape, etc.



Widely used by operators and inspectors on airplane, ordnance and industrial work.



Made in sizes from 1/4" to 7" diameter and larger, Comtorplug is used whenever precision bores are required: Ball bearing housings; propeller stud holes; wrist pin holes; etc., etc. Its use by machine operators as well as inspectors permits close teamwork for improved bores, fewer rejects, faster assembly. Makes every man in your shop "Master of Ten-thousandths!"

Request Bulletin 27

THE COMTOR CO. EST. 1928
70 RUMFORD AVE. WALTHAM, MASSACHUSETTS

myself come Semi-Annual next Oct., and gather evidence. And I think I'll talk Johnny Boe, Midland plant supt., into coming along provided we can get on the good side of the Old Man. John, by the way, should be going places in the A.S.T.E.; he's a swell fellow who makes friends and a fine organizer who gets things done. But now, if I go to Toronto, I'm shaking the mothballs out of the Tux as a compromise with Jack Thompson's all out soup and fish. Can't let those Canucks steal the show every time we meet.

For years and years, I've dreamed of the perfect engineering office, but never thought I'd live to see it. But now Al Sargent, Prex of Pioneer Eng'g. & Mfg. Co. and past National Sec'y. of the A.S.T.E. who put in a lot of work for the Society, has gone and built himself a place that outmodes tomorrow. It's got everything; no windows except weather eyes; air conditioning; shadowless lighting; working conditions that invite efficiency and large grounds with ample parking space for personnel and clients. Besides, it's sabotage proof and all but bombproof, and I'm not so

sure there isn't landing space for a plane, at least a helicopter. Well, Al is a fine engineer and a hard worker who puts everything he's got into the job at hand, and he's earned his success. And somehow, it seems entirely fitting that a Tool Engineer should be a trail blazer in the design of an engineering plant. Grow along, Al.

Reading the current *Houghton Line*, I ran across an excerpt from THE TOOL ENGINEER which the "near editor" of the *Line* (as Mr. Carpenter modestly styles himself) attributed to our editor. Actually, the item was taken from this column. But that's okay by me, provided a compliment was intended, when Roy can take the bouquet, but if the Near Editor implied a bit of polite panning (of which I get plenty and not always so polite) why, I'll take the rap. The fact is, as almost everybody knows, that I am not the editor of the T/E nor even a near editor. I'm just a near contributor given a certain license of expression for which the editor and the Society alike disavow responsibility. At that, I never could understand why the boys put up with my line, month in and month out, unless they're bears for punishment.

Well, Aaron, now that my status with the T/E is definitely established, we'll resume our interrupted conversation of a month or two back. I still don't see where our boys are going to fight (the Army, that is) unless it's in Africa. And we really don't want any of that, what with owning the Mojave Desert and Death Valley which are plenty hot and arid without dragging in the Sahara. Besides, Cleopatra's been dead these many moons and the present queen of Egypt is happily married. But that's not what I want to take up with you right now. Instead, we'll discuss this guy Lindbergh, whom you called "America's Gloomy Prophet". Now, I've sort of taken Lindy under my wing, partly a/c they're all ganging up on him and I'm usually for the under dog, and partly because his granddad hailed from my neck of the woods and besides I've relatives in Minnesota where they say a lot of Swedes emigrated and where George Wise learned to talk with an accent. But that irregardless, as Al Smith might have said, I have no illusions about Lindy, rather, have a fair idea how he got that way which isn't at all what Fred Collins, who has him on the pan in Liberty, would have us believe. But we'll not go into that now.

Like yourself, I'm allergic to controversy but enjoy a snappy conversa-

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—HANDY ANDY—

tion. And I agree plenty with your views, taking exception to just a few things. What do you mean (even if you lean on your friend) that Lindy started out on a wrong premise? That he did a Wrong Way Corrigan? Nossir, that boy has known where he was going right along and has been uncannily right in premise as well as goal. His cardinal sin is that he told truths that those in authority did not like to believe, much less listen to. If they had heeded!—but why suppose? The fire of war, with its blood and sacrifice, has been lit and must be stopped lest it become a holocaust. And patently, the United States is destined to arrest its spread. Yet, for us to enter the war now, actively, *could* court humiliation and defeat *provided that we were not ready*. That is what Lindbergh has been trying to tell us, but none so deaf as those who will not hear. As for aviation, sure the man is for the air, as was Billy Mitchell, also a "prophet of gloom" But oh, the vindication that is his! For, the conquests of the Axis to date, and at least one British naval victory, have largely been effected from the air. In this day and age the Eagle is the martial bird of prey.

You say that "flying the Atlantic a dozen years ago did not make Mr. Lindbergh an expert in international affairs". Probably not. But various flights of exploration, as well as sojourn in foreign lands, together with first hand observation of foreign air forces, would certainly give him a clearer insight into international affairs than is afforded the average rocking chair diplomat. And may I suggest that a peace must eventually be negotiated; it's just a question what sort of peace terms we (now that we're in the war) choose to listen to or which we hope to dictate. It would be a terrible thing if, in an age of vaunted enlightenment, diplomats could not negotiate a peace which would give to all peoples a hope of economic salvation. For on no other premise can a future world peace be predicated.

Just one thing more, Aaron. You concede that it would be impossible" . . . to land a properly equipped expeditionary force on the continent of Europe". Then, (but conditionally) you say that it would be comparatively easy for Germany to land an expeditionary force in the United States. Now, Aaron! Oh sure, I know all about our wide open spaces and all that but did you ever stop to think that coast artillery guns could stop almost any enemy fleet long before its transports could land troops? And that intercep-

(Continued on page 117)

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» » A. S. T. E. DOINGS « «

By IRWIN F. HOLLAND

Buffalo-Niagara Frontier

The regular monthly meeting of the Buffalo-Niagara Frontier Chapter of the A.S.T.E. was held on May 22 at the University Club, with 110 members and guests attending. Mr. George Keller, Past Chairman introduced Mr. Aubrey Dayman, Supervisor of Defense training

at Buffalo Technical High School, who spoke briefly on defense training and the need for capable instructors.

Chairman Allen C. Siegel introduced the speaker of the evening, Mr. J. R. Longwell, Chief Engineer of the Carboloy Company of Detroit, who spoke on cutting production time through the use

of modern tool holders. Mr. Longwell's talk appeared in the Buffalo Papers the following day.

Mr. Longwell stressed the necessity for proper design in toolholders in order to cut down set-up time and change over after the tools are sharpened. He pointed out that the Tool Engineer could greatly assist in expediting production by giving proper consideration to set-up in designing the tools and toolholders for the job.

Mr. Longwell particularly stressed the advantages to be gained in production by the use of toolholders which do not require expert tool setters to set them up. This particularly, in view of the fact that there is a shortage of skilled men for this as well as for other types of work. He stated that the most important thing is to keep the machines running and to do what is necessary to get away from the methods used by our grandfathers.

Dayton

About one hundred of the Dayton Chapter members were present at the June 9 meeting at the Gibbons Hotel where Charles Hook, President of the American Rolling Mills Company, was the guest of honor.

Mr. Hook was introduced by the "Co-Chairman of the Month" H. J. Pippert and gave a most illuminating discourse on "National Defense-Understanding the needs of the Hour" in which the position of industry in the Emergency Program, what it has done and is doing, were clearly outlined. His remarks on what we are preparing to defend and what we must defend against and the importance of unity were most inspiring.

It should be noted that the Meetings Committee under Jack Blair is doing a bang-up job in presenting such speakers as Mr. Hook.

Hartford

A record breaking attendance of 350 members and guests attended the Fourth Annual Spring Outing of the Hartford Chapter. The program started with a Golf Tournament at one o'clock directed by Bob Grant, former Connecticut State Amateur Champion, who was assisted by Dick Holt. Adrian Buck had low net for the day with 68. The Pro's Kickers Tournament was won by Bill Gourlie with a fine 70 net. Among the winners of prizes in the A.S.T.E. Kicker's Tournament were Bob Toppin, Jack Grant and John Maxwell. A competition was



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SIMPLE TO ATTACH—Within 1 to 2 hours, the duplicating Tracer Head may be added to any Gorton Mill built since 1935. Once attached, this head need never be removed. You are always ready to do either simple duplicating work or vertical milling, whichever is needed.

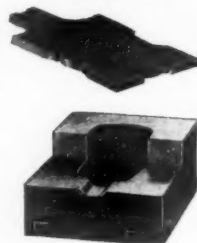
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—A.S.T.E. DOINGS—

held for the coveted R. T. Palmer Inter-Chapter Cup which was again retained by the powerful Hartford Team.

Bob Morris supervised the Spike Driving Contest (see photograph to find out how not to drive a spike). This was the most popular event of the afternoon, and was won by Ernest Goff who drove



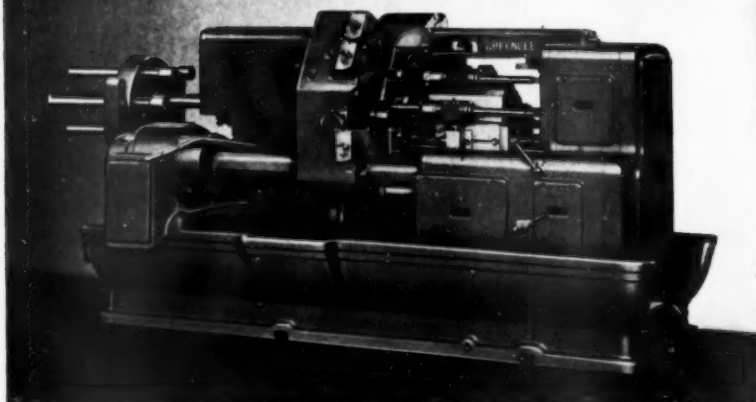
Hartford Outing (right)
A. H. d' Arcambal gives a driving lesson to (right to left) Frank Curtis, national president of A.S.T.E.; Irwin F. Holland, editorial chairman; Henry I. Moore; Henry A. Rockwell; and Ken Thomas.

5 KINDS OF SPEED IN GREENLEE AUTOMATICS

Here's speed designed and built right into the machine . . . five kinds of speed in every Greenlee Automatic Screw Machine turned off the assembly floor. Speed in a machine today, involves more than actual running time, it's a combination of various factors which help to lower the total production time required for a job. Here are five reasons why Greenlee Automatics can save you time, and increase production on every job . . . long or short runs.

- 1 The wide range of tool slide feeds and spindle speeds permits maximum operating speed.
- 2 Set-up time is cut to a minimum because of convenient collet arrangement . . . separate, interchangeable cross-slide cams . . . and the end working slide which is controlled by easily adjusted dogs on face of the worm wheel.
- 3 The tool slide arrangement makes possible the splitting up of long operations and the grouping of successive operations at one position to insure the fastest possible production time.
- 4 Sturdy, rigid construction in the frame and operating parts eliminates costly down time due to breakage and wear.
- 5 The wide open accessibility to all tools and spindles and the handy arrangement of all controls and adjustments make the Greenlee faster to operate.

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a seven inch spike into the beam in the record number of seven blows. A prominent member of the Society (R.H.M.) won the Booby Prize with a grand total of 35 blows—there's a trick to all trades.

The Putting Competition, with a likewise large attendance, was won by Bob Smith and Charlie Olson with 35 strokes. This was ably supervised by Lou Eberts who counted every stroke and gave no "gimmies".

The Horse Shoe Pitching Contest was supervised by Dick Holden and won by Jim Vandergrift. Second prize in the event went to Louie Horvath.

The banquet started at seven o'clock with Henry Rockwell as toastmaster assisted by the chapter officers and executive committee. Frank W. Curtis, Chief Engineer of the Van Norman Machine Tool Company and National President of the A.S.T.E., was guest of honor and made a very enlightening short speech on National Defense Activities in the Hartford Ordnance District.

Houston

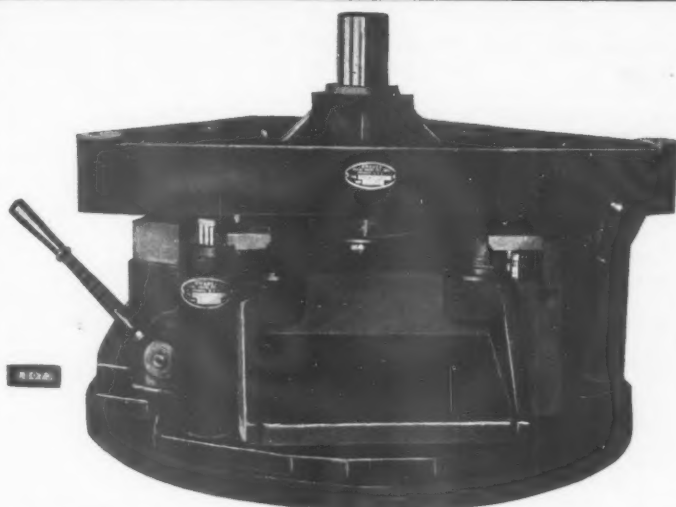
The Houston Chapter closed their season's activities with their first outdoor "relaxation" meeting with a basket dinner at the Harris County Park on the shores of beautiful Clear Lake twenty miles from Houston, at 6 p.m., June 6.

They were blessed with an attendance of 35, including a visitor from the fair city of Chicago, Mr. H. D. Frueauff, representing the Stuart Oil Company of that city. Soft ball and croquet had their innings before lunch and afterwards dancing in the club house.

When the ladies finally gave the order to "fix forks and charge", dignity was thrown aside and no wonder. There may have been larger picnics and more food, but none was ever finer or more temptingly prepared. Every lady present was voted the right to add the letters C.E. after her name. (Cuisine Engineer) or may be "Engineeress".

Minneapolis-St. Paul

The Twin City Chapter held its meet-



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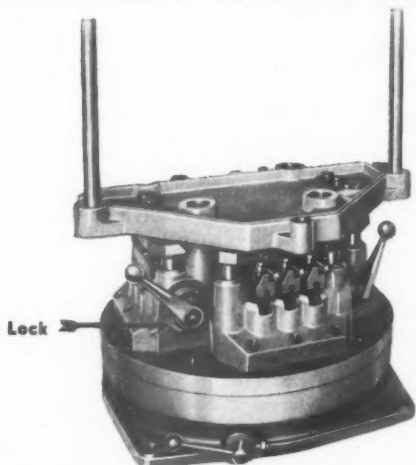
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ing at Dunwoody Institute on May 14. Dinner was served at 6:30 with twenty-three members and guests being present.

After dinner, the regular meeting was held, at which time Mr. George Wise swore in the new officers of the Chapter. Mr. Glen Roberts gave a talk on "New Developments of the Study Club."

The speaker of the evening was Mr. H. C. Timberlake, Manager of the Industrial Coordination Department, Federal Reserve Bank, Minneapolis, whose subject was "What the Defense Program Means to the Northwest Industries." This was a very interesting talk, followed by a very good discussion in which several members participated.

A motion was made during the discussion by Mr. Lind and seconded by Mr. Timberlake, that the facilities of the Twin Cities Chapter of the American Society of Tool Engineers be made available to plants of the Northwest and the Office of the O.P.M. in Minneapolis, but particularly to plants doing National Defense work, to help as a group or as individuals in any way possible for them to do. The motion was carried.

Moline-Tri-Cities

The June meeting of the Tri-Cities Chapter was held in Kewanee in the form of a joint meeting with the Peoria and Rockford Chapters. An afternoon

inspection trip was made through the Walworth Company in Kewanee. Twenty-five members attended this trip which started at 1:00 p.m.

The 6:30 dinner and meeting was attended by 107 Tool Engineers. Mr. W. Z. Fidler of the Tri-Cities Chapter acted as Chairman for this meeting in the absence of Mr. Gilchrist who made most of the arrangements.

There was special entertainment for this meeting which was presented before the speaker, Mr. H. M. Huffman, Cincinnati Milling Machine Company, was introduced. Mr. Huffman's subject was "Physics of Metal Cutting" and was illustrated with two reels of film.

Southern Connecticut

The first monthly meeting of the "Baby" Chapter was held in the Garde Hotel. Mr. Henry Bellemore as Chairman gave a nice little "pep" talk, which was appreciated by all present, and if his instructions are followed out there will be no doubt that this Chapter will have the largest organization of its kind in the country right in New Haven.

There were about thirty members present for dinner and as many more came for the meeting.

Mr. V. H. Erickson of the Norton Company gave a very interesting talk on "abrasives" which was exemplified with moving pictures and well appreciated.

Mr. Harry Chillis, Vice President, in charge of the meeting asked the question as to what subjects would be most interesting in having for future meetings.

Mr. Bellemore closed the meeting at 10:30.

Greater New York

The Greater New York Chapter held its Monthly meeting on May 12. Mr. Orchard made the announcement that there was to be formed a committee of twenty-five or thirty members to work in the various Plants for the good of the Chapter and to increase the membership as much as possible, by having a direct contact in each major plant. The new meeting place in the North Ballroom at the Hotel New Yorker, was announced at the meeting and the members were advised that the September meeting would take place on September 15, the third Monday with a special dinner and speakers. The third Monday was chosen because of the fact that there is a question about the official date for Labor Day, whether it will be first or the eighth. Mr. Orchard at this time introduced a fellow member, Mr. Ragot, who gave a brief talk on his connection as instructor of defense schooling at the Brooklyn Polytechnic Institute, and a

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A. S. T. E. DOINGS

general outline was given of the methods used. Some of the students' work was exhibited.

Mr. Cortlyn Rhodes, Chairman of the Speakers Committee, introduced Mr. Frank Hoagland who gave a talk, illustrated with slides, on the subject "Jig Boring and Use of Precision Tools." Following the discussion, there was a question and answer session.

Philadelphia

The Philadelphia Chapter held its regular monthly meeting and dinner on May 15 at the Engineers' Club, 1317 Spruce Street, Philadelphia.

Mr. J. A. McMonagle, Chairmna, at this point took over the meeting. Mr. Paul Frankfurter, Sr., Chairman of the Membership Committee, spoke briefly on the new membership drive and appointed Captains for the competing teams.

After the business meeting, the speaker of the evening was Mr. J. D. Trethaway, who gave an illustrated lecture on "Application of Bismuth Alloys for Industrial Purposes". The subject was well handled by Mr. Trethaway, who dwelt on its application to the Punch and Die Industry in particular. A well selected table display was also furnished by Mr. Trethaway, which was well patronized. After the speaker finished, the meeting was turned over to the Entertainment Committee, who put on a good floor show.

Pittsburgh

Pittsburgh Chapter No. 8 held its regular dinner meeting on June 6 at the Penn.-Lincoln Hotel in Wilkinsburg, Pa. There were thirty-six persons present for the occasion.

After some reports from various other committee Chairmen, Mr. Ford introduced the speaker of the evening, Mr. William Adam, vice president of the Ajax Electric Company of Philadelphia who spoke on recent innovations in salt bath furnace practice. The speaker's talk was extremely well prepared and delivered and was illustrated with numerous lantern slides which ably served in bringing out the various points of the talk. A very satisfactory and instructive discussion of the subject took place at the conclusion of the talk.

San Francisco-The Golden Gate

The Golden Gate Chapter held its June Meeting on Tuesday, June 10, at the Engineers' Club, San Francisco. There was an attendance of 50 members and guests.

After dinner a program of "Technical Information Please" was put on. The Board of "Experts" consisted of the following men: Messrs. Bues, Burlingame,

DoAll SAWS

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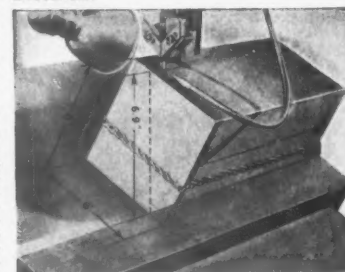
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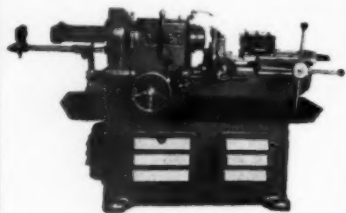
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— A. S. T. E. DOINGS —

Edwards, Hair, King, Kruse, King, and the interrogator was Mr. W. Kassobohm. Any question that could not be answered by the experts carried a cigar as a reward. The ability of the experts can be attested by the fact that only two cigars were passed out during the evening. One cigar was put in escrow pending the clearing up of one question upon which neither the umpire or the audience could agree.

South Bend

On May 13 the South Bend Chapter of the A.S.T.E. held its regular monthly meeting. The meeting was held at the Indiana Club and was preceded by a dinner.

The principal speaker of the evening was Mr. E. L. Hemingway of Foster Machine Company, Elkhart, Ind. He gave a lecture on "Bearing Improvement by Super Finish," which was illustrated with one reel of motion pictures. This was very interesting and was appreciated by all present.

The principal speaker was followed by an entertainment feature of three reels technicolor motion pictures of fishing, as a courtesy of the South Bend Bait Company. This proved very novel and entertaining.

The dinner was attended by 106 members and the lecture was heard by 150 members and guests.

Twin States

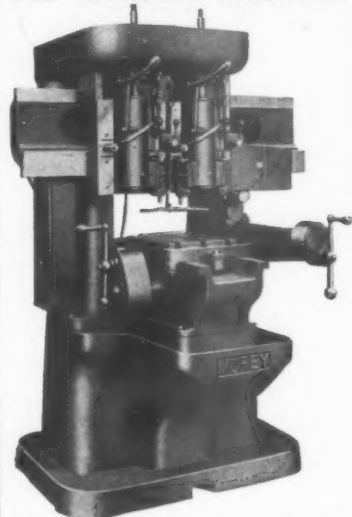
The Chapter gathered at 7 p.m. for the usual banquet preceding the meeting which was held on May 22 at the Windsor House, Windsor, Vt. Seventy-five members were in attendance. Three more members, making a total of 78 present, put in an appearance by 8 p.m., at which time the meeting was called to order by Chairman Wilbur Handy. Members were present from Boston and also Shelton, Conn.

Mr. Handy announced that Mr. Jennings, Secretary of the Chapter, had found it necessary to resign his office and it would, therefore, be necessary at this time to elect someone to fill his place. Philip C. Durland, employee of the Bryant Chucking Grinder Company, was nominated from the floor and the nomination was seconded. Since no other nominations were made, the candidate was voted into office by a show of hands.

The guest speaker for the evening, whom Mr. Handy introduced was Mr. Frank Curtis, Chief Engineer of the Van Norman Machine Company and who is also the National President of the A.S.T.E.

Mr. Curtis complimented the Chapter on their attendance and wide-awake attitude. He then proceeded to talk on

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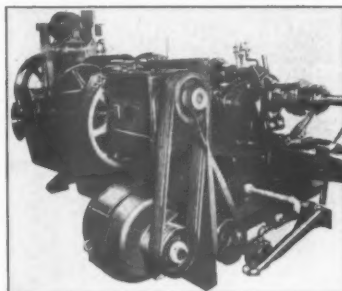
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Flexoid Speed Control

Converts old machine tools into modern individual drives



Flexoid Unit applied to Cleveland Automatic

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The Smith Power Transmission Co.
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A. S. T. E. DOINGS

jig and fixture design, a subject on which he is a recognized authority. He had many slides to illustrate good and bad designs.

Mr. Curtis explained that this branch of machine tool industry has come into being step by step over a long period of time and that rather than adhering strictly to strict rules, it is usually better to use originality, provided, of course, that correct design principles are always present.

St. Louis

The monthly dinner meeting of the St. Louis Chapter was held at the Melbourne Hotel, June 12, with around 100 members in attendance. Entertainment Committee Chairman "Bigger and Better Time Than Ever" Doogan, made his final appeal for the cooperation of all members, in making the July 12 Picnic, a real success. Chairman Burnside introduced the speaker of the evening, Mr. V. K. Parker of the E. W. Bliss Co. He showed by slides and movies, the application of hydraulic and power presses to sheet metal working. It was most interesting. It was announced, that members Ott and Laffler, fearing that the draft age might be raised to 70, had recently sought refuge in marriage.

The next meeting will be September 11.

Syracuse

For the final meeting of the 1940-41 season held on June 9 the Syracuse Chapter gathered at Deauville on Owasco Lake, in Auburn, N. Y. This was the first occasion for our Auburn membership to act as our host and in counting noses it was found that the turn-out for dinner and meeting was unusually large. Chairman Adams expressed his appreciation on this score, while the members commented on the excellent steaks. Beside the good food, as entertainment for the evening a novelty musical program was included by the committee.

The technical side of the evening consisted of an interesting and instructive talk with movies by W. P. Powers of the U. S. Tool Co., whose subject was: "Multi-slide Presses and High Production Milling."

We hope that when the chapter meets again to eat, drink, and play at the Clambake on September 6, the members will have enjoyed a pleasant summer and a healthy vacation. A prize will be awarded at the clambake for the tallest story about fishing, golf, or any other sport or vacation experience that any member wants to tell. Invitation to enter this contest in person is extended to fellow Tool Engineers of the other chapters.

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Designed for serial numbering of machine parts, bars, plates, etc. such as found in airplane, castings, and steel mill production. Made with our patented Safety Snap which provides a quick change of type inserts. Can be constructed for any size of number of characters. Constructed to give long, reliable service with the maximum of safety. Will NOT spall or mushroom.

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NEW LIPE Pneumatic BAR FEED



Lets You Throw Away Your FEED FINGERS!

It's a self-contained, automatic, power feeding device. Eliminates old-style feed mechanism. Works with any machine having a fixed stop for determining length of work. Cannot scratch or mar any material. Feeds rapidly any distance. Accurate. Eliminates noise.

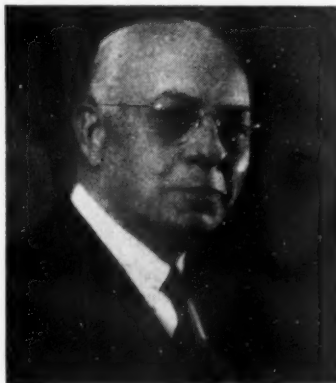
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for itself. Write
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**SAVES TIME
AND MATERIAL**
• Operation is instantaneous. Feeds the entire length of the bar.
• It is reloaded quickly.
• Requires no operator attention or energy.

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The Passing Parade

A. F. Dohn, formerly vice president in charge of tool steel sales of the Allegheny Ludlum Steel Company, has announced his retirement from active business interests. He has long been a popular figure in the field and is one of the best informed tool steel men in the country. Howard M. Givens, Jr. steps into the post vacated by Mr. Dohn's retirement. Other changes made in the firm include the elevation



Crucible's Dohn

A popular tool steel executive.

of George W. Evans to General Superintendent of the Brackenridge, Pa., plant and Carl B. Pollock to manager of the same plant. Melvin C. Harris was appointed district manager of the Pittsburgh Area plants. Stanley A. McCaskey was elected assistant secretary of the company. A new product and process development department was created with W. E. Griffiths as manager and W. F. Detwiler, Jr. as assistant manager.

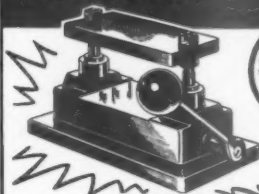
Howard F. MacMillin, president and general manager of the Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, was recently tendered a testimonial dinner by a group of business associates.

Thomas F. Toy, who has been associated with the Mayhew Steel Products Company for a number of years and for the last two years employed at the Norwich, N. Y. plant of the company has been appointed assistant superintendent of the Mayhew plant in Shelburne Falls, Mass.

R. D. Yoder has been transferred from the Milwaukee headquarters of Cutler-Hammer, Inc., to the company's Cincinnati office.

C. M. Maratta, maintenance engineer for the Timken Roller Bearing Company, has been appointed chief works engineer to fill the vacancy left by the

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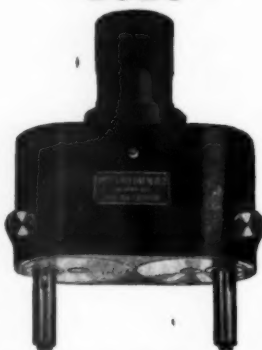
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Gives you a ready-designed drill jig body that greatly reduces the tooling time and helps you get into production faster. You'll be amazed at its loading and unloading speed. Positive, quick action lever locks work instantly — holds securely — throw it back and work is released. No complicated adjustments. No costly drill fixtures needed — just a comparatively inexpensive drill bushing plate and adaptor for each job. Sturdily constructed thruout — nothing to get out of order. Pays for itself many times over. Only \$29.75 f.o.b. Chicago.

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MONEY BACK Guarantee
ORDER TODAY

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30 DIFFERENT STANDARD SIZE
ADJUSTABLE DRILL HEADS,
CAPACITIES UP TO 1 1/2" DRILLS

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Adaptable to virtually any machine tool made... for jobs requiring small quantity of coolant. Gusher model P-3

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Model P-3 Puts and Puts. Pends.

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1815 READING ROAD, CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

JULY, 1941

—PASSING PARADE—

death of W. C. Makley. Walter F. Green becomes assistant works engineer, Putney L. Wright is made plant engineer.

John F. Byrne, of Pittsburgh, has been appointed general manager of Koppers United Company's newly-created Blast Furnace Division. Mr. Byrne has been with the company since 1925 and for several years has served as an assistant to the vice president.

R. P. Nichols, formerly secretary, has been named vice president and general manager of the Bantam Bearings Corporation, South Bend, Ind. J. Frank Oehlhoffen, who has been serving as assistant sales manager, has been promoted to sales manager.

N. A. Woodworth, founder of the Ex-Cell-O Corporation in 1919 and for 18 years its president, has organized the Suprex Gage Company and appointed William F. Klemm its general



Woodworth



Klemm

Entered the gage field.

manager. The new firm has taken over a plant in Pleasant Ridge, a suburb of Detroit, Mich.

M. R. Dill has been elected a director of the Lincoln Electric Company. He was also elected general counsel of the firm.

H. E. Doughty has been appointed manager of the recently established Philadelphia Branch of the Jessop Steel Company, Washington, Pa.

Hollis U. Gordon and Chester L. Glover have opened offices in Detroit to represent the National Broach and Machine Company and the Cone Automatic Machine Company.

Samuel W. Moore, formerly assistant master mechanic at the Jessop Steel Company, has been appointed construction engineer in charge of plant rehabilitation and new construction.

J. Arthur Deakin has been appointed eastern district manager for McKenna Metals Company, Latrobe, Pa.

D. L. Davis has been appointed factory manager in charge of engineering and production of the Tuthill Pump Company, Chicago. Mr. Davis was formerly Tool Engineer with Savage Arms, chief engineer of Teetor Adding Machine Company, factory manager for W. A. Sheaffer Pen Company, consulting engineer with Trundle Engineering,

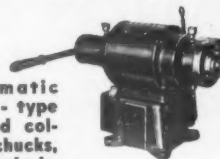
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For speedier, more economical finishing of small metal and plastic parts...

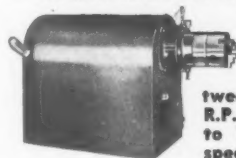
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• IDEAL SPEED LATHE

Equipped with single or 2-speed motor; exclusive, automatic brake; spring-type hand-operated collet, or step chucks, expanded mandrels.



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• We design special lathes to meet individual production requirements.

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No. 00, 2 & 2G Brown & Sharpe
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Assorted High Speed & Sliding Head

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6" x 32"; 10 x 18, 24, & 36 Norton Plain
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Hendey Yoke Head, 12 x 5, 16 x 8 and 18 x 10'
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44" x 44" x 18' Niles Tool Works, 4 Heads
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176

—PASSING PARADE—

and assistant works manager of Hurley Machine Company.

Charles C. Merz, president of the Merz Engineering Company, Indianapolis, announces that the firm of Design and Tool Engineers has moved to its new plant at 200 South Harding Street, Indianapolis.

The American Steel & Wire Co. Worcester, Mass., announced June 14 an exchange of jobs between Francis P. Leahy, superintendent of the South Works Wire Mill, Worcester and Van H. Leichter, superintendent of the Cuyahoga Works Wire Mill in Cleveland. Mr. Leichter will be in charge of the consolidation of the Worcester wire mills under the present rehabilitation program.

Norton Co. of Worcester, Mass., has loaned four more of its staff of scientists to the government for full time defense development work. Organic specialists loaned are Carroll C. Misen, Burton G. Ebbeson and Stanley E. West. The fourth man is Arthur B. Wentzel, mechanical section scientist. They have taken offices at the Navy Yard, Washington.

Jack L. Axelson, son of D. F. Axelson, was married recently to Marilyn Bennison. Jack is a grandson of C. F.



Jack Axelson
Entered into matrimony.

Axelson, one of the founders of the Axelson Manufacturing Company, and is now working in the lathe assembly department of the plant.

James Y. Scott, president of Van Norman Machine Tool Co., Springfield, Mass., has been appointed chairman of the United Service Organization campaign in Springfield.

DIED

George Coleman Brady, 56, sales and service manager at the Yale & Towne plant, Stamford, Conn., died at his home in Darien, June 16, after a heart attack. Mr. Brady has been associated with Yale & Towne for the last forty-one years.

SHELDON

Back Geared Screw Cutting
PRECISION LATHES



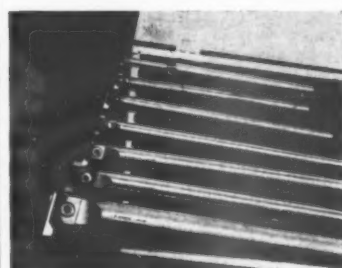
1" Collet Capacity—Ball or Roller Bearing

No. 88 U-1136 WQ Sheldon 11" swing 36" between centers pre-loaded ball-bearing spindle, hardened and ground all over, inside and out with 1 1/2" hole thru center, hand scraped bed, ways (2 V-ways, 2 flat ways) full quick change gear box, worm feed apron with power cross feed, thread chasing dial and 4-speed lever operated underneath pedestal motor drive, and telescopic taper attachment.

Write for Catalog showing complete line of Sheldon Precision Tool Room and Manufacturing Lathes, attachments, and accessories; Sheldon Arbor Presses and Sheldon Drill Press and Machine Vises.

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EVEREDE BORING BARS



Number 3 Set

These are the only boring bars on the market having the economical triangular bit, permitting the use of a larger bar diameter as the bit cuts ahead of the bar. This new design insures rigidity, making higher boring speeds and heavier cuts possible.

Everede Boring Bars are made of the finest heat treated nickel steel and each bar is furnished with six triangular high speed steel bits.

The Everede Boring Bar also permits the use of a solid stellite or carbide tool bit by clamping the bit in the "V" Type grip holding it firmly without danger of breakage.

Write for descriptive folder.

EVEREDE TOOL CO.

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THE TOOL ENGINEER

PASSING PARADE

Horatio A. Porter, 86, inventor of machining devices and tools died recently at Holyoke, Mass. For many years Mr. Porter conducted a machine shop with his brother James. At one time he was connected with the Deane Steam Pump Company, Holyoke.

Patrick J. Greaney, 70, founder and owner of the Holyoke Asbestos & Magnesite Works, Holyoke, Mass., died June 10 in a hospital, following a short illness. Fifty years ago he formed the asbestos firm.

Robert C. Douglas, 62, general manager of Norton Co. of Canada, Ltd., and formerly of Worcester, Mass., died suddenly in Hamilton, Ont., after a brief illness. He had been manager of the Norton plant in Hamilton since its establishment in 1920. Previously he was associated with Norton Co. in Worcester 11 years and one time was district sales manager for the company in New York State. Before becoming associated with Norton Co. he had been employed by the old Crompton Loom Works.

Extensive Vocational Training Needed

The urgent need for skilled workers in the Country's National Defense effort, is bringing the importance of the vocational school to the forefront as never before.

Through this agency thousands of men are learning and improving skills that industry must have to carry out the accelerated plans for increased production on a scale without parallel in industrial history.

Ample evidence of how readily industry utilizes the men turned out by the vocational school can be had from the personnel records of companies engaged in National Defense work in this section of the Atlantic Seaboard.

At the RCA Manufacturing Company in Camden more than 1,000 of the men employed on defense work have been

JULY MEETINGS

DETROIT—July 19. Bonnie Brook Golf Club. Eight Mile Road at Telegraph. There will be golf, dinner, entertainment and prizes.

TOLEDO—Golf tournament. Place and date will be announced later.

TWIN CITIES—(Minneapolis - St. Paul) July 9. 6:30 P.M. St. Anthony Comm. Club. Since this is a social meeting for the Papas, Mamas and sweethearts there will be no speakers.

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SITUATIONS AVAILABLE

SALES AND SERVICE ENGINEER wanted for Boston, Mass. by leading manufacturer of machine tools. General knowledge of machines and machine shop practice essential. State complete details and compensation desired. Box 717, The Tool Engineer.

trained in vocational schools or in vocational classes in public schools. More than 750 of them are products of the Camden County Vocational School. Others have passed through the Bok or Murrel Dobbins Vocational Schools in Philadelphia, or have had instruction in mechanical precision work in high school and elsewhere.

While many of these men were company employees who had attended schools for special instruction, several hundred of them never before had worked in an industrial plant before they secured employment with RCA. All have completed an intensive vocational training course as provided through the program of the Office of Production Management in Washington.

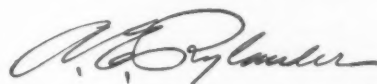
HANDY ANDY SAYS

(Continued from page 105)

tor planes could deter if not entirely arrest an air armada such as trans-oceanic vessels could carry? And that shore batteries could smash lighters and that tanks would crush the vanguard? We're building all these things, you know, even if with our mania for speed we grumble at the pace of traffic. And then, there's our "Devil Dogs" and some millions of hell-bent-for-leather doughboys, rarin' to go. After all, we are one hundred thirty million people, and that means a lot of bricks in our ramparts. But, anything being possible, it *could* happen, again

provided that we weren't ready. But it couldn't happen easily. The point is that we mustn't let it happen, and I think we're all agreed on that. Well, that's all for now, Aaron, and I'm quite sure that, having written without heat, you'll take my comments with a smile. May you go on, catching bigger and better fish.

Handily Yours,



JULY, 1941



TO HELP YOU TEACH THE NEW GRINDER HAND

how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

KOEBEL DIAMOND TOOL CO.
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KOEBELITE DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

WE INVITE INSPECTION OF DETROIT'S MOST EFFICIENT AND WELL EQUIPPED MACHINE TOOL REBUILDING PLANT LET US GIVE YOU AN ESTIMATE ON COMPLETELY MODERNIZING YOUR OLD MACHINES

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R-105	L-106	$\frac{7}{16} \times \frac{7}{16} \times 3$
R-107	L-108	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$

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Tool No.	Shank Size
300	$\frac{1}{4} \times \frac{1}{4} \times 2$
301	$\frac{5}{16} \times \frac{5}{16} \times 2\frac{1}{2}$
302	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
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Tool No.	Shank Size
200	$\frac{1}{4} \times \frac{1}{4} \times 2$
201	$\frac{5}{16} \times \frac{5}{16} \times 2\frac{1}{4}$
202	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
203	$\frac{7}{16} \times \frac{7}{16} \times 3$
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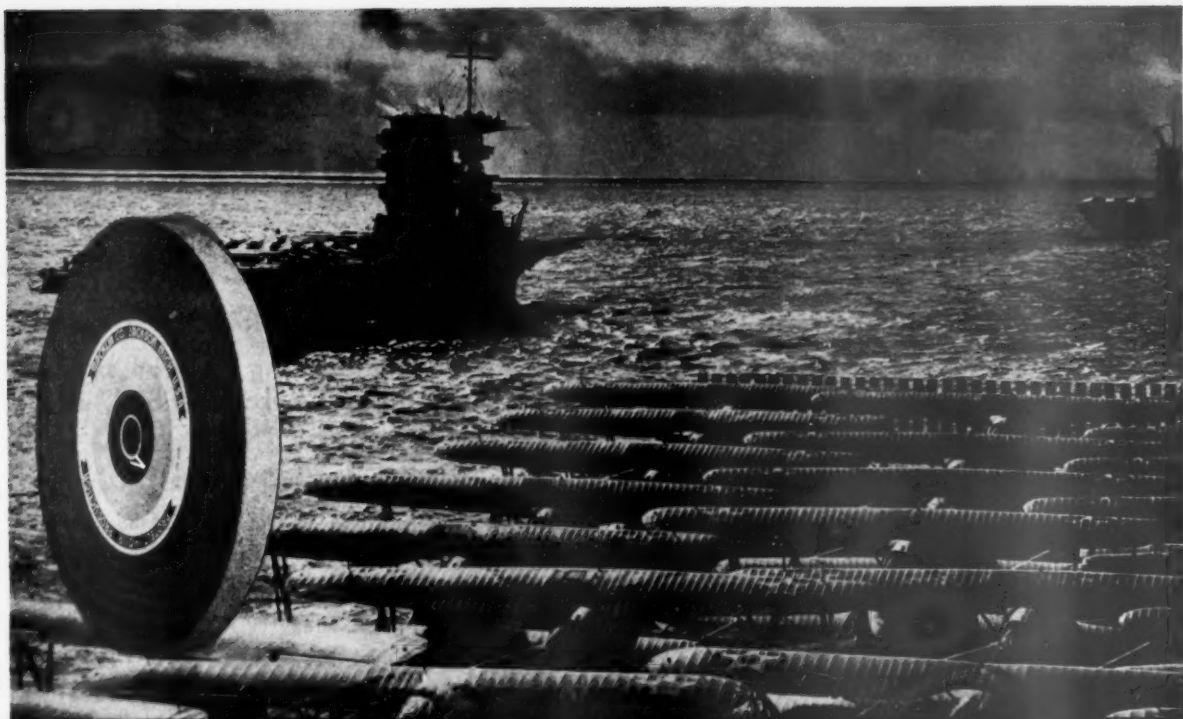
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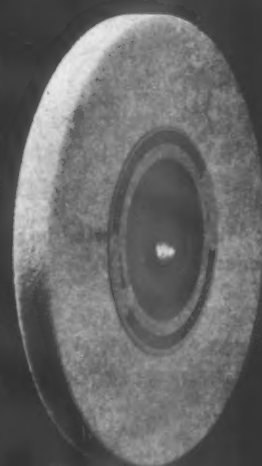
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